Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

In this issue—

- Freezing Oysters — P. 1
- Antibiotic for Salmon — P. 3
- Curd in Canned Salmon — P. 5
- Permeability of Films — P. 11
- Vitamins in Fresh Tuna — P. 19

— and 33 others

OCT 1956
LIBRARY
FISH & WILDLIFE SERVICE

Vol. 9 No. 10 October 1956

Fish and Wildlife Service
U. S. Department of the Interior
Washington D. C.

UNITED STATES
DEPARTMENT OF THE INTERIOR

FRED A. SEATON, Secretary

FISH AND WILDLIFE SERVICE

JOHN L. FARLEY, Director

Commercial Fisheries Abstracts

Prepared in the Branch of Commercial Fisheries

EDITORS

A. W. ANDERSON, Chief, Branch of Commercial Fisheries

DONALD Y. ASKA, Chief, Educational and Market Development Section

ASSOCIATE EDITOR

MAURICE E. STANSBY, Chief, Pacific Coast and Alaska Technological Research

ASSISTANT EDITORS

KATHRYN L. OSTERHAUG, Fishery Products Technologist, Seattle

F. BRUCE SANFORD, Chemist, Seattle

Applications for COMMERCIAL FISHERIES ABSTRACTS, which is mailed free to members of the fishery industries and allied interests, should be addressed to the Director, Fish and Wildlife Service, United States Department of the Interior, Washington, 25, D.C.

Fulfillment of foreign requests confined to Government agencies, research institutions, and libraries.

The Service assumes no responsibility for the accuracy of material from outside sources, and can fulfill requests for copies of the articles only if the abstract was taken from a Service publication. Readers should direct requests for other articles to the author of the article or to the publication in which it appeared. The addresses of these publications are available from the Fish and Wildlife Service, Washington 25, D. C., and will be sent to inquirers upon request.

The abstracts in this leaflet may be left in their present form; but it is suggested that to make the most efficient use of them, they be cut out on the lines designated and filed by the number in the upper left-hand corner of each. For a full description of this filing system see "Fishery Technological Abstract Card System" by Maurice E. Stansby and K. L. Osterhaug, Fishery Leaflet No. 232, obtainable free by request from Fish and Wildlife Service, Washington 25, D. C.

In addition to the regular abstracts, there is included a bibliography of references of secondary importance (without abstracts). These may be cut off on the lines designated and pasted on standard 3 x 5-inch cards for filing.

Following is a brief outline of this filing system. The numbers apply to the first digit appearing on each card. For the meaning of subsequent digits, please see the above described leaflet.

0	General and theoretical	5	Vitamins
1	Fish by species	6	Fishery byproducts
2	Fresh fish	7	Analytical Methods
3	Preserved fish	8	Composition
4	Oils	9	Miscellaneous

Issued with the approval of the Bureau of the Budget, December 29, 1953

0.36 DISTRIBUTION OF PYRIMIDINE BASES IN HERRING-ROE DEOXYRIBONUCLEIC ACID

Kent, P. W.; Lucy, J. A.; and Ward, P. F. V. (Department of Biochemistry, University of Oxford)
The Biochemical Journal 62, 529-533 (December 1955)

Introduction.--Herring-roe deoxyribonucleic acid (DNA) was treated with ethanethiol in the presence of hydrochloric acid, and the non-diffusible derivative, mercaptalated deoxyribonucleic acid (MDNA), degraded with alkali to a mixture of stable pyrimidine polynucleotides (PPN).

Experimental.--MDNA was prepared by treating 0.49 grams of fibrous DNA with 15 milliliters of ethanethiol and 0.5 milliliter of hydrochloric acid (sp. gr. 1.18) and shaking 14 hours at 18° C. Unchanged thiol was removed by ether extraction after diluting the mixture with 45 milliliters of water. The aqueous layer was adjusted to pH 7 with sodium carbonate, and dialyzed in cellophane until chloride free. Freeze drying of the sac contents gave 45 milligrams of white amorphous MDNA containing: 9.90 percent nitrogen, 9.62 percent phosphorus, and 7.8 percent sulphur. A similar product was prepared from commercial herring-roe DNA containing: 8.43 percent nitrogen, 7.46 percent phosphorus, and 5.9 percent sulphur. The mercaptalation of apurinic acid prepared from DNA was attempted.

PPN was prepared by treating MDNA with alkali, then dialyzing and freeze drying as described above. It contained: 6.91 percent nitrogen, 9.31 percent phosphorus, and 3.3 percent sulphur. The properties of both MDNA and PPN were examined by paper chromatography. Attempts to desulphur and methylate MDNA gave products containing from 6 to 13 percent of the desired product.

Results.--MDNA was found to be an amorphous solid, highly soluble in water, negative to

(over)

 ABSTRACTER: Claude Thurston

1.10 TUNA

Anonymous
Pacific Fisherman (Yearbook Number 1956) 121-148 (January 25, 1956)

The first year since 1942 that the American pack of tuna did not register an increase over that of the past years was 1955. In fact a cut-back of approximately 1.15 million cases was made to meet a softening in market demand. Despite the reduced pack, as compared with the year before, American tuna canning in 1955 amounted to 9,732,822 cases.

Burden of the reduction resulting from surfeited demand was borne wholly by the American producers, as import figures for 1955 indicate that there was a moderate increase in shipments of foreign tuna -- both canned and frozen.

California tuna producers took a sharp revision in price from $330 to $270 for Yellowfin, with corresponding cuts for other species. The year 1955 will be remembered because for weeks, and sometimes months, boats were held in port, waiting for cannery orders to unload.

For eight weeks tuna canning in the San Pedro and San Diego plants stopped while the cannery workers struck during September and October for higher hourly wages and welfare benefits. Fishermen and canners all through 1955 fought a losing battle to secure a quota on imports of (1) frozen tuna and (2) tuna canned in brine. The tariff on tuna-in-oil was reduced from 45% to 35% ad valorem but imports of raw tuna, principally from Japan, ran far ahead of the first 10 months of 1954.

The American tuna industry spent in excess of 9 million dollars during 1955 to advertise tuna as a highly desirable protein rich food.

 Reprinted in part

0.5 BACTERIAL FLORA OF FRESH SHARK

Venkataraman, R. and Sreenivasan, A. (Fisheries Technological Station, Kozhikode)
Current Science 24, 380-381 (November 1955) (Reprinted)

In this note we are presenting the results of an investigation of the shark Carcharius spp. The huge shark was caught off Tuticorin and was alive. The flora of the skin was plated out on board under aseptic conditions, before the shark was lowered on the deck.

The majority of colonies on the plates were pigmented. Gram negative, non-spore-forming rods were very few, whereas gram positive, spore-forming as well as non-spore-forming rods and cocci were abundant. Six strains resembling Micrococci cundidus were recorded and nine of Bacillus, some of the latter having shades of yellow and rose colour. Nine strains of Corynebacterium were identified, five of which had yellow chromogens and two pink to red. Corynebacterium helvolum, C. globiformae and C. simplex were noted. One strain of pinkish red, non-acid fast gram positive branching rod resembling Nocardia was also encountered. The other genera represented are Achromobacter (3 strains), Flavobacterium (1 strain) and Vibrio (1 strain) besides four other micrococci also. One non-chromogenic yeast was also present.

The bacterial flora of off-shore sea-water off Tuticorin studied by us, included Corynebacterium (pink, yellow, white), Flavobacterium, Achromobacter, Bacillus, Micrococcus and Vibrio which were also present in sharks. The sea-water also contained a large number of Pseudomonas and Bacterium.

As against the presence of indole and H_2S producers in teleosts none were found in shark. Starch was hydrolysed by a large number of cultures (23 out of 34) but very few (8 strains) could produce faint acidity in glucose. Similarly, nitrate reducers, were also few (10 cultures). Gelatin liquefiers were

(over)

 Reprinted in part

1.81 FROZEN OYSTERS

Morton, Margaret L. and Dyer, W. J. (Atlantic Fisheries Experimental Station, Halifax, N. S.)
Journal of the Fisheries Research Board of Canada 13, 47-51 (January 1956)

Quick frozen freshly shucked Atlantic oysters (Ostrea virginica) stored at -10° F. did not deteriorate significantly during nine months of storage. Those which were frozen slowly and stored at 10° F. lost quality much more quickly and darkened in color to an objectionable extent.

Experimental procedure.--Fourteen gallons of freshly shucked oysters were washed in a 0.75 percent salt solution and drained. Monosodium glutamate was added to one lot of 3 gallons to a concentration of 0.1 percent. All of the oysters were then packed in 8-ounce flat cans, sealed, and frozen. Half of the untreated oysters were slowly frozen during about 15 hours, in moving air at 10° F.; the remainder, including the glutamate-treated lot, was quick frozen in brine at -10° F. One-half of each frozen lot was stored at a constant temperature of 10° F. and the other half at -10° F.

Samples of the oysters were removed from storage every three weeks and examined for color, appearance, and odor. They were presented to a taste panel for judging in the form of simmered oysters and in oyster stew. It was found that more differences could be noted when judging simmered oysters than when judging the same oysters in stew.

Results.--A slight darkening appeared in 2 to 3 months in all samples and intensified on storage up to 9 months. However, only those oysters frozen slowly and stored at 10° F. became badly discolored. This happened after 6 months storage.

The average grades found by the taste panel are shown in figure 1. The quick frozen samples stored at -10° F. dropped very slowly in quality during storage up to at least 8 months.

Those samples stored at 10° F. decreased in quality at a much faster rate. The initial decrease was greater, to about 75 percent in a month's storage and on down to about 50 or 60 percent in 6 or 7 months. The slowly frozen sample stored at -10° F. was only slightly better. The monosodium

(over)

 ABSTRACTER: Kathryn L. Osterhaug

PYRIMIDINE BASES IN HERRING-ROE

FLORA OF FRESH SHARK

1955 TUNA PACK

FREEZING OYSTERS

0.5 (Cross Reference: 1.70)

abundant (25 strains) while milk-peptonizing cultures were few (10 in number). Two cultures produced urease in Christensen's medium. It is possible that more of them would prove urease positive in media such as Gibson's, as was noted by us in the case of urea-splitting bacteria from 'Chanks' (unpublished, 1954). Enrichment cultures showed production of ammonia from urea, when dilutions from the surface swab were inoculated, into them.

0.36 (Cross Reference: 1.2)

Fehling's reagent, and differing little from the parent nucleic acid in its thymine to cytosine ratio. It gave less coloration in the Dische diphenylamine reagent test than did the parent DNA. Sedimentation constants obtained with the Svedberg centrifuge were lower than those for DNA. Two ultraviolet-absorbing components were detected by paper electrophoresis. MDNA was readily degraded in alkaline conditions and increased in optical density. At least two deoxycytidine phosphate-type diffusible products were formed.

Discussion.--The experimental results indicate that the mercaptanolysis of deoxyribonucleic acid is achieved through the purine-linked sugars giving residues of much lower molecular weights. Purines and nucleotides are liberated in the process but no more than traces of pyrimidines and inorganic phosphates were detected. Mercaptalation converts the purine-linked sugars into stable acyclic derivatives having an additional hydroxyl group which renders them alkali-labile. Mercaptalation appears to involve the separation of consecutive pyrimidine nucleotides from DNA without possible ambiguities of enzymic rearrangements. The authors believe there are regions in DNA where at least three pyrimidine nucleotides are linked together.

1.81 (Cross Reference: 3.249, 3.239)

glutamate-treated samples stored at the same temperatures were almost indistinguishable from the untreated ones.

The average moisture content of the oysters was found to be 90 percent. The total nitrogen was 0.83 percent and non-protein nitrogen 0.08 percent. The fat content averaged 2.7 percent, individual samples varying from 1.6 to 3.5 percent. The pH varied from 5.5 to 5.8 and showed no change during storage.

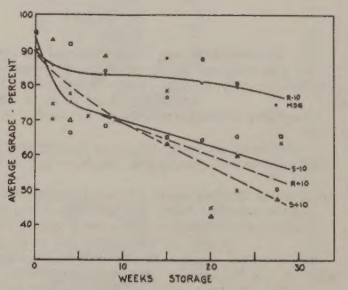


FIG. 1.—Average taste panel assessment of simmered oysters: Effect of freezing rate and storage temperature.

●	R—10	Rapid frozen, stored at −10°F. (−23°C.),
O	S—10	Slow frozen, stored at −10°F.,
×	R+10	Rapid frozen, stored at +10°F. (−12°C.),
Δ	S+10	Slow frozen, stored at +10°F.,
□	MSG	R—10 plus monosodium glutamate.

1.10 (Cross Reference: 9.2)

2.114 TRANSPORT AND STORAGE OF FISH IN REFRIGERATED SEA WATER: I. REFRIGERATED SEA-WATER INSTALLATION ON THE VESSEL J.R.D.

Harrison, J. S. M. and Roach, S. W. (Pacific Fisheries Experimental Station)
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations No. 104, 3-6 (November 1955)

Introduction.--Refrigerated sea water equipment for holding fish was installed on the J.R.D. (1) to obtain data for design and operation of systems larger than were used in previous experiments (Pacific Progress Reports No. 98, April 1954 and No. 100, October 1954) and (2) to learn if a large system is practical for packers where conditions of receiving, stowing, and transporting fish are different from those found on trollers. The J.R.D. is a wooden vessel, 60 feet long with a single hold forward of the deck house and in regular service carrying salmon from the fishing grounds to the cannery. Three tanks were fitted into the hold of the J.R.D. These consisted of a transverse tank in the forward end of the hold and a single tank on either side of the hold. A power unit, pumps, and a refrigerant condensing unit were mounted in a house forward of the tanks.

Installation details.--The three tanks are shaped to fit the hold and to provide a combined capacity for 50,000 pounds of fish. Each tank is equipped with a trunk 4 x 5 feet in size that extends 1 foot above the deck from the top of the tank. Each trunk is covered with a gasketed hatch lid. When the tanks are in use they are filled to within 6 inches of the top of these trunks. This arrangement of trunks reduces the free water surface that is subject to movement in the tanks during rolling or pitching of the vessel. As a result, surging of the contents of the tank is prevented and vessel stability is not affected. The tanks are of welded construction and made from 1/4 inch Alcan B54 SF aluminum plate which is resistant to sea water corrosion. The tanks have been stiffened by spot-welding 2 x 2-1/2 x 1/4-inch aluminum angles to their external sides. Each tank has 2 inches of cork insulation applied to its external surface.

(over)

 ABSTRACTER: Martin Heerdt

2.12 LONGLINE FISHING FOR DEEP-SWIMMING TUNAS IN THE CENTRAL PACIFIC, 1953

Shomura, Richard S. and Murphy, Garth I. (Pacific Oceanic Fishery Investigations, U. S. Fish and Wildlife Service, Honolulu, T. H.)
Special Scientific Report, Fisheries No. 157, 1-70 (September 1955)

This is the fourth in a chronological series of reports on a survey of the deep-swimming tunas of the central equatorial Pacific. Six cruises (5 of the J. R. Manning and 1 of the H. M. Smith) during 1953 are covered by this report. Catch data of Japanese fishing in the area during 1953 is also given. The area surveyed by the U. S. vessels lies within 15° south latitude, 17° north latitude, and 140° and 170° west longitude; and the area of the Japanese operation lies within 1° and 12° north latitude and 160° and 180° west longitude.

Description of the primary longline gear used appears in previous reports. A set of this gear included 19 to 40 six-hook baskets. Briefly, a basket consisted of a 1,260-foot mainline with six 88-foot branch lines attached at 30-fathom intervals. Floats with 10-fathom lines were attached at the ends of each basket. Additional depth was obtained by setting the 1,260 feet in about 900 linear feet so that considerable sag occurred. Experimental 11-hook gear with 2- and 3-fathom branch lines attached every 15 fathoms along the 1,260-foot mainline was used some during each of the six cruises. The shorter branch lines tangled severely on the mainline until wire links were put into the mainline where the branch lines are hooked on. This modified gear caught more fish per basket, but not quite as many fish per 100 hooks.

Catches during the several crossings of the equatorial current system were consistent with earlier findings. Yellowfin were most abundant in the region near the Equator which is enriched by upwelling.

(over)

 ABSTRACTER: M. R. Greenwood

2.114 TRANSPORT AND STORAGE OF FISH IN REFRIGERATED SEA WATER: II. BACTERIAL SPOILAGE OF BLUE-BACK SALMON IN REFRIGERATED SEA WATER AND IN ICE, WITH AND WITHOUT ADDED CHLORTETRACYCLINE

Steiner, G. and Tarr, H. L. A. (Pacific Fisheries Experimental Station, Vancouver, B. C.)
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations No. 104, 7-8 (November 1955)

That the transportation of fish in tanks of refrigerated sea water on fishing vessels is practicable has been demonstrated in Progress Reports No. 100, pp. 3-5, October 1954 and No. 104, pp. 3-6, November 1955. In preliminary studies made to compare the rates of bacterial spoilage of salmon, the order of preference of various treatments was as follows: (1) refrigerated sea water with chlortetracycline (CTC); (2) ice with 1 part per million (p.p.m.) of CTC; (3) ordinary ice; (4) refrigerated sea water.

To obtain additional data concerning rates of bacterial spoilage of fresh fish in different media, immature coho salmon (blueback salmon), all caught within a 12-hour period and promptly dressed, were treated aboard the troller Phantom II as follows:

1. Immersed in sea water containing added sodium chloride to bring the specific gravity to 1.025 and refrigerated to 30° ± 0.5° F.
2. Same as treatment 1 except for 1.4 p.p.m. of added CTC.
3. Iced in ordinary ice at a fish temperature of approximately 32° F.
4. Iced in crushed block ice containing 1 p.p.m. of uniformly distributed CTC.

The treatment afforded the salmon aboard the troller was continued on shore when these salmon

(over)

 ABSTRACTER: Martin Heerdt

3.2 PROCEEDINGS OF CONFERENCE ON REFRIGERATION AND AIR CONDITIONING SEPTEMBER 13 AND 14, 1954

Anonymous
Department of Mechanical Engineering, Columbia University (New York) 1-129 (September 13 and 14, 1954)

TABLE OF CONTENTS

I. Progress in Air Conditioning

Air Conditioning Research in A.S.H.V.E.: Its Progress and Development	
Past Research	Clark M. Humphreys
Present Research	Richard S. Dill
Future Research	Elmer R. Kaiser
Climatology and Air Conditioning	John Everetts, Jr.
Modern Design Practice	Walter A. Grant
Physiological and Psychological Factors in System Design	Alfred Jaros, Jr.
Factors in the Conditioning of Modern Office Buildings	P. B. Gordon
Evolution of Packaged Air Conditioning Units	Justin Neuhoff
Present and Future Progress of the Heat Pump	Eugene R. Ambrose
Threshold Research in Odor Perception	Bernice M. Wenzel

II. Progress in Refrigeration

Developments and Changes in Refrigeration Insulation	John F. Stone
Progress in Commercial Refrigeration	Daniel C. McCoy

(over)

 Reprinted in part

SEA-WATER TANKS ON J.R.D.

ANTIBIOTIC FOR SALMON

TUNA EXPLORATION

PROGRESS IN REFRIGERATION

2.114 (Cross Reference: 1.33, 2.01)

were landed the day after capture. Additional CTC was added to the water used in treatment 2 after 14 days to bring the concentration of CTC to 1 p.p.m.

Four fish from each treatment were removed at 2, 9, 16, 23, and 30 days after capture, except in the case of the fish that had become too stale for further storage. A 1-inch thick steak was removed from each of these fish in the region of the anterior dorsal fin and incubated at 50° F. for one day before direct bacterial counts were made.

Bacterial counts were made from fish that were obviously stale without incubating the steaks.

The results obtained are tabulated, see table, right.

Salmon stored in sea water with CTC had a moderate bacterial count after 16 days, were comparatively good after 23 days, and not organoleptically stale even after 30 days. Salmon stored in ice containing CTC were rather similar bacteriologically to those stored in sea water containing CTC, but the counts obtained were higher. Salmon stored in plain sea water had lower bacterial counts and better appearance than salmon stored in plain ice. Poor results previously obtained with sea water alone were due to the water being heavily contaminated with bacteria from the unwashed fish.

Effect of four storage treatments on the keeping quality of immature coho (blue-back) salmon.

Type of Storage	Bacteria (x 10^6) per Gram* After Storage for 2 Days	9 Days	16 Days	23 Days	30 Days
Ordinary ice	0	14·0	342	(535)	...
	0	16·4	368	...	...
	0	16·7	286	...	...
	0	15·6	259	...	...
	Av. =	15·7	319	...	...
Ice containing 1 p.p.m. of CTC	0	1·80	6·77	124	...
	0	0·81	4·50	58	...
	0	0·85	3·97	61	...
	0	0·53	6·09	53	...
	Av. =	0·99	5·37	74	...
Refrigerated sea water	0	3·1	60·9	143	(80)
	0	1·9	60·9	159	...
	0	1·7	58·3	157	...
	0	6·4	60·4	217	...
	Av. =	3·3	60·1	169	...
Refrigerated sea water containing 0·7 to 1·4 p.p.m. of CTC	0	0·26	2·60	47	(23)
	0	0·26	4·77	47	...
	0	0·21	1·59	40	...
	0	0·34	2·60	...	...
	Av. =	0·27	2·89	46	...

*Counts were made by a direct method after incubating the steaks for 1 day at 50° F., except for those shown in parentheses, where there was no incubation.

3.2

Development in Large Capacity Refrigeration Systems	Matthew Lawler
Refrigerated Transport	John N. Kelley
Marine Refrigeration	James Scott
Evolution of the Household Refrigerator and Freezer	Milton Kalischer
Refrigeration of Fruits and Vegetables	Wilbur T. Pentzer
Design Transitions of the Cold Storage Warehouse	Paul B. Christensen
Time-Temperature Tolerance of Frozen Foods	Eugene F. Jansen
Heat Transfer in Production Food Freezing	William J. Finnegan
Production of Low Temperature: A Note on the Gay-Lussac Coefficient	James H. Potter

III. Jubilee Conference Dinner

The Impact of Refrigeration on our Modern Era	Samuel C. Prescott
Whither Mankind--and Air Conditioning	George S. Jones Jr.
Jubilee Vignettes from Abroad	

2.114

Cooling coils fabricated from Alcan 1 SF extruded tubing, 3/4-inch outside diameter, are installed in a compartment in each tank. Each tank contains 60 feet of cooling coil fabricated into 4 banks of coils.

The power unit for the refrigerant condensing unit and the sea water pumps is a Buda 2-cylinder air cooled full diesel engine rated at 13 brake horsepower when operated at 1800 r.p.m. for continuous duty.

The refrigerant condensing unit is a Carrier 2-cylinder Freon-12 compressor V-belt driven at approximately 600 r.p.m. and with a capacity of 60,000 B.t.u. per hour. The condenser is a stainless steel double-tube type, cooled by sea water from a self-priming centrifugal pump belt driven off the power unit.

Refrigerated sea water is circulated over the cooling coils and through the fish at approximately 70 gallons per minute by centrifugal pumps belt-driven by a lineshaft from the power unit. All sea water outside of the tanks is carried in plastic piping to avoid electrolysis in the aluminum tanks and coils.

Performance.--Excellent quality fish has been delivered by the J.R.D. The appearance and firmness of these fish is very striking. The equipment reaches and holds approximately 30° F. uniformly throughout each tank. The fish are loaded by dropping them through the hatch into the sea water holding tanks and are unloaded by means of a brail. The work involved in unloading is less than that required in unloading iced fish. The action of the filled tanks in rough weather has caused no difficulties that would affect either the vessel or the fish.

2.12 (Cross Reference: 1.0112, 1.1)

Bigeye were most abundant in the region of the Countercurrent, and albacore most abundant south of the Equator. Results suggest that the longitude of best catch changed during the year, and that east-west movements recur from year to year.

Catches around Christmas Island were better than in the open ocean, at least in part because small "surface yellowfin" were taken as well as large deep-swimming yellowfin. Yellowfin were usually caught in greater numbers on the deeper hooks of the longline. Bigeye and albacore catches exhibited this tendency more than yellowfin. During 1953 more small yellowfin were taken near islands than offshore. The size of oceanic yellowfin was uniform from 140° W. to 160° W. longitude, but was smaller at 170° W. The yellowfin caught at 150° to 155° W. longitude were of consistent size throughout the year.

Males predominated among the larger yellowfin, bigeye, and albacore. Shark damage to the tuna averaged 18.8 percent.

2.15 SPOILAGE OF FISH IN THE VESSELS AT SEA
2. TREATMENT ON THE DECK AND IN THE HOLD

Castell, C. H.; MacCallum, W. A.; and Power, H. E. (Atlantic Fisheries Experimental Station, Halifax, N. S.)
Journal of the Fisheries Research Board of Canada 13, 21-39 (January 1956)

The effect of various treatments that fish (haddock) receive aboard trawlers at sea was studied and the following conclusions were reached:

(1) Washing the gutted fish increased the keeping time very little or not at all except in the case of grossly contaminated fish that came from the bottom of the checkers.

(2) Bruising or crushing the fish on the deck through careless handling gave an effect that was inconsistent, and in no instance was accelerated spoilage observed until the fish were at least 6 or 7 days in the hold.

(3) Carelessness in eviscerating the fish in which the knife punctures the fillet or in which bits of intestine are allowed to remain in feeding fish resulted in accelerated spoilage in the area involved, but only after the fish had been in ice for 6 or 7 days.

(4) Exposure of the fish on deck during warm summer weather resulted in a softening of the fillets and accelerated spoilage. An exposure of similar or longer duration during cool spring weather, however, resulted in very little or no softening and acceleration of spoilage.

(5) Fish that were carefully iced in boxes retained their quality much better than similar fish

(over)

 ABSTRACTER: Martin Heerdt

2.15 TRANSPORT AND STORAGE OF FISH IN REFRIGERATED SEA WATER:
III. CURD IN CANNED SALMON AS RELATED TO POST-MORTEM AGE OF FISH

Schmidt, P. J. and Idler, D. R. (Pacific Fisheries Experimental Station, Vancouver, B. C.)
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 104, 9-10 (November 1955)

Curd detracts from the appearance of canned salmon. An earlier issue of these Progress Reports (No. 21, pp. 10-13, 1934) recommended treatment to eliminate curd. The present experiments attempt to correlate curd with the post-mortem age of the salmon and with different storage conditions.

Blue-back salmon held in the four different manners described in Part II of this series and table 1, were canned as follows: Steaks cut from each salmon just ahead of the dorsal fin, were put into one-half pound cans, vacuum closed, and processed for 90 minutes at 240° F. Afterward, the canned steaks were examined for curd on the basis of five grades defined as follows: (1) no curd; (2) very slight traces; (3) thin deposits covering not more than 25 percent of the top surface; (4) thick deposits covering not more than 50 percent of the surface and definitely objectionable; (5) thick heavy deposits covering over 50 percent of the area. The

Table I.—Curd in canned blue-back salmon.

Storage Condition of Fish Before Canning	Storage Period					
	1 Day		1 Week		2 Weeks	
	No. of Fish	Curd Grading	No. of Fish	Curd Grading	No. of Fish	Curd Grading
Plain ice	7	1	4	3	4	3
Refrigerated sea water	7	1	4	1	4	2
CTC ice	7	1	4	3	4	4
Refrigerated sea water containing CTC	7	1	4	1	4	2

(over)

 ABSTRACTER: Martin Heerdt

2.15 PRESERVATION OF FRESH FISH IN CHILLED SEA WATER

Lantz, A. W. and Gunasekera, C. (Fisheries Research Station, Ceylon)
Progress Reports Biological and Technological, Department of Fisheries, Colombo, Ceylon, No. 1 4-6 (July 1955)

Purpose.--The purpose of this investigation was to chill and hold fish as a fresh product in 2 percent salt brine maintained at 30° F. Approximately 24 hours was required for the 26 gallons of brine in the tank to be cooled from 85° F. to 30° F. before the fish could be placed in the brine.

Experimental.--Red and grey mullet, soles and several species of mackerel all of varying size were held in chilled brine. After 5 days all of the fish were in good condition. Small sardines (uneviserated) were held up to 8 days in chilled brine without any signs of decomposition. However, gill color became less pronounced in all of the fish, and after two days this color had a faded appearance. In an effort to preserve gill color, 0.01 to 0.02 percent sodium nitrite was added to the brine. Several varieties of trawl-caught fish that had been preserved in ice from one to ten days aboard the ship were placed in the nitrite brine.

Results.--The gill color of all of the various fish held in brine faded in 3 to 6 days. Uneviscerated fish showed considerable autolysis of the viscera after 5 to 8 days in brine whereas eviscerated fish showed some softening of the flesh or gills after 8 to 21 days in the brine.

The appearance and flavor of small uneviscerated sardines chilled in brine within 24 hours of capture and maintained at 30° F. for a period of 8 days could not be distinguished from fresh sardines. After 9 days in brine slight loss of flavor was detected in these sardines.

(over)

 ABSTRACTER: Martin Heerdt

2.1121 FISHING METHODS AND GEAR - DRAG NETS - OTTER TRAWLS

Von Brandt, A.
Die Fischwirtschaft 6, 73 (April 1954)
World Fisheries Abstracts 7, 19 (May-June 1956)

As with some seines, the cod end of small trawls are closed by a line in the same way as bags are bound. The cod end of larger trawls used by cutter and trawlers are closed by a complicated knot of the rope. Principally, the knot is the same everywhere and variations consist only in the number of windings or the use of an auxiliary line. The latter facilitates the opening of the knot for unloading the trawl. In the case of large catches or frosty weather, it might be difficult to undo the knot. In the Danish cutter fishery, simple closing devices have been developed. This may be a simple wooden peg holding the loop together, laid around the end of the cod end. Moreover, metal apparatuses have been designed, which are supposed to achieve a quick closing and opening of the cod end. Figure 1 (see over) shows an apparatus operating like a jack-knife. The end meshes of the cod end are taken up by loop A. If the apparatus is open, the loop A gets very small and the net is closed. If the apparatus is folded together, the loop A get very large and the cod end is open. Figure 2 (see over) shows a different apparatus, where the end meshes of the cod end are collected on a wire A, the circumference of which corresponds to that of the net opening. For closing the net, the meshes are drawn together by a U-shaped metal hoop and hindered from falling apart by a lock B. The lock can easily be opened by pulling the line E (compare this equipment with that described in DP 933 959 - German Patent).

(over)

 ABSTRACTER: A. von Brandt

HANDLING FISH ON VESSEL

HOLDING FISH IN CHILLED SEA WATER

CURD IN CANNED SALMON

CLOSING COD ENDS

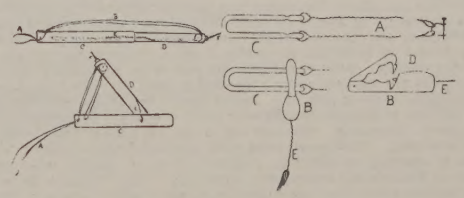
2.15

Deterioration of flavor and odor of eviscerated trawl-caught fish was readily noticeable after 21 days of storage in brine. However, deterioration of the flavor of eviscerated trawl-caught fish was detected after only 5 days in brine (1 to 10 days on ice plus 5 days in brine). After 8 days in brine (1 to 10 days on ice plus 8 days in brine) the flavor of eviscerated trawl-caught fish was unpalatable.

Conclusions.--Storage in chilled brine appears to retain the quality better and yield a better product than storage in crushed ice. This is probably because of the uniform cooling and the exclusion of air. Fish stored in chilled brine were not bruised as were fish stored in ice. Chilled brine storage did not appreciably affect the flavor of the fish. Fading of gill color was retarded somewhat by the addition of sodium nitrite to the brine.

2.1121

Fig.1 Fig.2



2.15 (Cross Reference: 2.01, 2.19)

iced in pens by the fishermen. When special care was used by the fishermen to ice the fish thoroughly in the pens, the difference in keeping time in ice in pens versus keeping time in ice in boxes was considerably smaller.

(6) Crushing the fish, because of inadequate shelving in the pens, did not accelerate bacterial spoilage, but it did contribute to the quantity of soft and inferior-looking fish.

(7) If fish are pressed against the wooden pen boards during transit in ice, they spoil quite rapidly. Washing the pen boards did not prevent the occurrence of spoilage or the rapidity with which it took place.

(8) Fish stowed in ice at the bottom of the pen spoiled more rapidly than fish stowed in ice at the top of the pen even if both were well iced and held away from the pen boards.

(9) Almost all ice and natural ice in particular that has not been washed before it is crushed can contribute a significant number of spoilage bacteria to fish. Ice that has been stored in dirty pens can carry and transfer bacteria from the dirty pen surfaces to the fish.

Further studies with fish aboard the boat should include the following: (1) continuous washing of the round fish in the checkers to remove excess faeces before the fish are gutted; (2) continuous gutting arrangements on the deck of the vessel so that the viscera and faeces are not thrown back upon the ungutted fish; (3) a means of gutting fish to avoid puncturing or cutting the edible muscle portion and to eliminate residual intestine from the gut cavity; (4) a means for rapid handling of fish on deck during warm weather to reduce exposure of the fish; (5) the use of a bactericide or bacteriostat in the water used for washing or in the ice used for chilling the fish; (6) means of preventing the fish from coming in direct contact with the pen boards; (7) care in stowing the fish in ice so that they are chilled rapidly and held as near to 32° F. as possible while in pens at sea.

2.15 (Cross Reference: 1.32, 3.33)

results are recorded in table 1.

The amount of curd obtained from freshly caught Fraser River sockeye salmon canned in a similar manner is shown in table II.

Sockeye salmon obtained from various locations were also canned in a similar manner and evaluated for curd. The results are given in table III.

Table II.—Curd in canned sockeye salmon.

Length of Storage from Time Caught	Storage Conditions	No. of Fish	Curd Grading	
			Round	Gutted
30 hours	ice	8	2	..
50 "	ice	10	4	..
3 days	refrigerated sea water	4	4	4
5 "	39°F.	5	5	..
7 "	ice	4	4	3
7 "	refrigerated sea water	4	4	4
10 "	ice	4	5	4

Table III.—Curd in sockeye salmon from various locations.

Location of Catch	No. of Fish	Post-mortem Age of Fish	Curd Grading
		Days	
Rivers Inlet	15	4	2
West Coast Vancouver Island	5	3	2
Fraser River	9	1½	3
Port Hardy	5	3	3

A comparison of Fraser River salmon with Rivers Inlet salmon shows that wide variations in the amount of curd may be expected from different species of salmon and possibly from the same species caught in different areas. All of the salmon investigated so far have shown increased curd with increased fresh storage time, but curd increased much more rapidly with storage time in Fraser River sockeye than it did in the blue-back salmon. Proteolysis of the type encountered in belly-burn, Part IV of this series, did not correlate with curd formation as evidenced by the slower onset of curd in blue-backs compared to sockeye. An increase in curd on storage is possibly related to the formation of certain types of soluble proteins.

2.15 TRANSPORT AND STORAGE OF FISH IN REFRIGERATED SEA WATER: IV. PRELIMINARY REPORT ON NITROGEN LOSS, WEIGHT CHANGES, AND PROTEOLYSIS (BELLY-BURN)

Barker, R. and Idler, D. R. (Pacific Fisheries Experimental Station, Vancouver, B. C.)
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 104, 16-18 (November 1955)

Change in weight and loss or organic nitrogen.--Round and eviscerated blue-back and sockeye salmon less than 1 day old were stored 4 to a bag in polyethylene bags in the ratio of 3 parts of salmon to 1 part of sea water. The bags were then entirely immersed in sea water maintained at 30° to 31° F. Bags of salmon were withdrawn at intervals of 3 days. The change in weight of the salmon and the sea water was determined, and the salmon flesh and the sea water were assayed for total nitrogen. The results are given in table I.

To compare these losses with the amount of nitrogen lost from iced salmon during storage, three round sockeye were iced in a plastic bag insulated with glass wool; and the bag was hung in a room maintained at 39° F. The water from the melted ice in the bag was collected. One pound of water per pound of salmon in the bag was collected in 7 days. Round sockeye salmon stored in this way lost 2.4 percent of their initial weight and 2.5 percent of their total protein in 7 days, whereas salmon stored in refrigerated sea water, table I, gained in weight and lost less total protein than did the salmon stored in ice.

Five fresh sockeye salmon were prepared and stored in the same way as the blue-back salmon above except that these salmon were stored in 10 times their weight of refrigerated sea water. These salmon gained five times as much in weight and lost five times as much protein as similar salmon

(over)

 ABSTRACTER: Martin Heerdt

2.19 AN INVESTIGATION INTO THE KEEPING QUALITIES OF UNGUTTED FISH FROM THE TRAWLERS

Lantz, A. W. and Gunasekara, L. D. (Fisheries Research Station, Colombo, Ceylon)
Progress Reports Biological and Technological, Department of Fisheries, Colombo, Ceylon, No. 1, 1-4 (July 1955)

Spoilage problems assume considerable magnitude in warm climates, therefore it has become general practice on board trawlers to remove the entrails of all fish weighing over 2 pounds before they are stored in crushed ice. In recent years, however, the wisdom of this practice has been questioned.

Objectives.--Investigations were made, therefore, to determine the following: (1) can 'round' fish with the viscera intact be transported satisfactorily in a trawler under prevailing weather conditions without undue deterioration in quality; (2) what is the quantity and quality of fish liver now being discarded with the viscera; (3) is it feasible to utilize the entrails now being thrown overboard; (4) is it practical to eliminate the gutting operation on board trawlers so as to save the viscera for processing ashore?

Experimental.--The different fish that were included in this study are mentioned below. Paired lots of gutted and ungutted fish were identified with special marks at the time they were stored in crushed ice in the ship's hold. All of the fish were examined immediately on landing for odor, color of gills, and other external signs of quality. Their condition as well as the weights of the different components of the viscera were tabulated. Storage of all of the fish in boxes in ice was continued in cold rooms on shore after the fish were landed. Periodic examinations were made at intervals to determine the relative keeping qualities of round versus eviscerated fish.

(over)

 ABSTRACTER: Martin Heerdt

2.15 TRANSPORT AND STORAGE OF FISH IN REFRIGERATED SEA WATER: V. SALT PENETRATION

McBride, J.; Murray, J. F.; and MacLeod, R. A. (Pacific Fisheries Experimental Station)
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 104, 19-22 (November 1955)

Young coho salmon were dressed and stored at 30° to 31° F.: (1) in ice; (2) in ice containing chlortetracycline (CTC); (3) in sea water; and (4) in a salt solution approximating sea water plus CTC. The salmon were sampled three at a time at weekly intervals for 4 weeks. Three 1/2-inch slices, taken from each fish, were boned and skinned. The flesh obtained was homogenized and analyzed separately for sodium and potassium with the aid of a flame photometer attached to a spectrophotometer. A summary of the analyses appears in table I. The encircled values show that a peak level of sodium ion concentration occurred nearly 3 weeks after the fish were caught. Sodium accumulation was apparently due to binding of the sodium ion by the protein and was almost independent of the sodium concentration in the sea water. Potassium was lost from the flesh rather than maintained or accumulated.

To measure the rate of sodium uptake, eviscerated coho salmon were immersed in groups of three in refrigerated sea water immediately after capture, removed at appropriate intervals after immersion, and the sodium and potassium content of the flesh determined. The results appear in table II, omitted.

To test the practicability of potassium chloride as a storage solution, four groups of fish (three fish per group) were selected. Two of these groups, one eviscerated and one in the round, were immersed in a 5.85 percent sodium chloride solution. The other two groups were immersed in 7.45 percent potassium chloride solution. Each group of fish and its corresponding salt solution in a ratio, respectively, of three to one (by weight) was kept separate in a water-tight plastic bag immersed in a tank of refrigerated sea water for 7 days. The groups absorbed approximately equal weights of potassium or sodium.

(over)

 ABSTRACTER: Martin Heerdt

3.234 PRELIMINARY NOTE ON THE MUSCULAR TISSUE OF THE FISH, TAIUS TUMIFRONS, FROZEN BY VARIOUS METHODS

Kobayashi, H. and Nishikawa, S.
J. Shimonoseki Coll. Fish. 4, 189-196 (1955) (Summary in English 189)
Food Science Abstracts 27, 516 (November 1955)

Ice crystals in the muscles of the frozen fish were largest when air-freezing was used, smaller with sharp-freezing, and smallest with Ottesen's freezing method. Curves show the distribution of crystals of different sizes found in fish muscle frozen by the 3 methods. With air-freezing and sharp-freezing, ice crystals were mainly in the spaces between the muscle fibres, or between the fibres and the perimysium; with Ottesen's freezing method, they were within the muscle fibres. In air-frozen and sharp-frozen muscle, transverse section revealed deformation of muscular elements caused by ice crystals, with shrinkage or distortion of the otherwise clear-cut polygonal outlines of the muscle fibres; myofibrils were disordered. Sectioning in paraffin wax increased the histological damage caused by freezing. In muscle frozen by Ottesen's method, the microscopic structure resembled more closely that in live fish.

 Reprinted in whole

SALMON IN SEA WATER

SALT PENETRATION IN SEA WATER

HANDLING FRESH FISH

CRYSTAL FORMATION IN MUSCLE

2.15 (Cross Reference: 1.33)

Table I.--The effect of storing dressed coho under various conditions on the sodium and potassium content of the flesh.

Weeks	Treatment	% Na	% NaCl	% K	% Na in water	% K in water
0	Control	0.055	0.140	0.405		
1	Ice	0.058	0.147	0.347	.....	.....
	Ice + CTC	0.065	0.165	0.330	.....	.....
	Sea water	0.367	0.933	0.261	.....	.....
	Sea water + CTC	0.393	0.998	0.280	.....	.....
2	Ice	0.054	0.136	0.289	.....	.....
	Ice + CTC	0.059	0.151	0.251	.....	.....
	Sea water	0.522	1.326	0.152	0.295	0.066
	Sea water + CTC	0.543	1.380	0.194	0.800	0.080
3	Ice	.....	.....	.....	.....	.....
	Ice + CTC	0.054	0.137	0.247	.....	.....
	Sea water	0.648	1.648	0.134	0.265	0.066
	Sea water + CTC	0.772	1.964	0.104	0.794	0.079
4	Ice	.....	.....	.....	.....	.....
	Ice + CTC	.....	.....	.....	.....	.....
	Sea water	0.519	1.320	0.115	0.800	0.057
	Sea water + CTC	0.585	1.488	0.115	1.300	0.081

3.234

2.15 (Cross Reference: 1.32, 2.03)

stored in a 3 to 1 ratio of salmon to sea water over a period of 3 days, according to the data reported in table 1.

Extent of proteolysis during storage.--Salmon stored in refrigerated sea water in plastic bags, as described under change in weight above, were taken from storage at 3-day intervals; and their belly flaps were removed for a determination of the extent of proteolysis (belly-burn). These flaps were skinned, frozen, ground thoroughly, mixed, and extracted with water in a Waring blendor. The homogenate was centrifuged to remove insoluble residue. The total nitrogen, protein, peptide, and amino acid content of the water extract were determined. The peptide nitrogen content of the flesh increased tremendously as belly burn increased.

Table I.—Changes in weight and protein losses in salmon stored in refrigerated sea water.

	Storage Time, Days 0	3	6
	%	%	%
Blue-back Salmon—			
Round: Gain in weight	0	2·9	3·3
Protein in flesh	20·0	19·8	19·3
Proportion of total protein in sea water	0	0·7	1·3
Gutted: Gain in weight	0	2·8	3·7
Protein in flesh	20·0	17·6	16·8
Proportion of total protein in sea water	0	2·6	3·3
Sockeye Salmon—			
Round: Gain in weight	0	0·4	0·2
Protein in flesh	18·6	18·6	17·7
Proportion of total protein in sea water	0	0·4	1·2
Gutted: Gain in weight	0	0·8	1·4
Protein in flesh	18·6	17·8	16·5
Proportion of total protein in sea water	0	0·8	3·2
Round (in large volume of sea water):			
Gain in weight	0	1·4	2·7
Proportion of total protein in sea water	0	1·6	3·0

2.19 (Cross Reference: 1.015)

Results.--The maximum holding period or time in storage in ice for round and for dressed fish was as follows:

1. Meevatiya (sea bream) and lavaya (rock cod), approximately 6 days in the round. After the sixth day the eyes were somewhat dull in appearance, the gills were dull brown in color, the gill covers had a putrid odor, the skin was faded, the flesh was soft, and the viscera was pale and bleached. The maximum holding period for dressed sea bream and rock cod was over 14 days.
2. Golla (red snapper), approximately 4 days in the round. After the fourth day the discernable signs of spoilage were dull eyes and pale colored gills and viscera. The maximum holding period for dressed golla was over 12 days.
3. Boraluwa (grunt) and badaw (blue-spotted snapper), approximately 4 days in the round. Spoilage progressed slowly and some of these fish appeared fairly good with respect to their eyes, color of gills, and odor of flesh even after 6 days. The maximum holding period for dressed grunt and blue-spotted snapper was over 14 days.
4. Detta (surgeon fish), 7 days in the round. The maximum holding period for dressed surgeon fish was over 14 days. Dressed surgeon fish had better appearing eyes and gills than round surgeon fish.
5. Lomessa (streaker), one fish only, 7 days in the round.
6. Parati (cavallas), over 7 days in the round.

Conclusions.--This investigation indicates that eviscerated fish are superior to round fish in keeping quality when both are held in crushed ice. The viscera from fish taken at sea, which amounts to 6 or 7 percent of the total weight of the fish, can be utilized for the manufacture of fish-meal. A study to determine the possible utilization of an average waste of 2 tons of viscera per trip is in progress. The liver yield is only about 1 percent of the total weight of the fish caught at sea.

3.238 NEW METHOD OF FREEZING FISH IN JELLY

Anonymous
Canadian Fisherman 42, 14 (August 1955)

A new method of freezing fish in blocks has been developed in Norway, whereby round fish or fish fillets are frozen in a jellied mass having a freezing point below that of the fish. The method has already found a broad application in Scandinavia for freezing herring, mackerel, and other fat fish. The technical development of the method was performed by the firm A. S. Protan, Drammen, Norway.

Generally a temperature of -28° C. to -30° C. is sufficient for storing fish fillets in cartons for up to 12 months. With fat fish, however, the problem of rancidity presents new difficulties due to the influence of oxygen. A commonly used method of packaging, especially for round fish (salmon) is to glaze with ice by means of dipping the fish in cold fresh water and allowing it to freeze on the fish. The disadvantage of this method is that ice at low temperatures becomes brittle. Freezing of fish in blocks by complete immersion in water has the disadvantage that the goods are soft and inconvenient to handle after being taken out of the ice block.

The Protan-method has solved the difficulties mentioned above. It is a block-freezing process in which the fluid filled into the freezing cells to surround the fish is not water, but a common salt solution to which are added sodium alginate, certain salts, and a diluted acid with the effect that the mixture after a certain time turns to a jelly. One thousand kilograms of alginate-jelly mixture contains 40 kilograms of Protan-Frostgel powder, 6 liters of 80 percent lactic-acid, and the remainder is water.

Cartons containing the fish to be frozen are saturated with this fluid, which fills all the air-spaces and forms a layer around the fish.

(over)

 ABSTRACTER: M. Patashnik

3.238 THE EFFECT OF TYPE OF SCALD AND WRAP ON THE MARKET QUALITY OF FROZEN POULTRY

Margolf, P. H., Callenbach, E. W., Miller, R. C., Nicholas, J. E.; Perry, J. S.; Cone, J. F.; Murphy, J. F., Dodds, M. L.; and Bennett, Grace (The Pennsylvania State University)
Poultry Science 35, 37-46 (January 1956)

Experimental.--Two hundred and twenty New Hampshire pullets that were selected for uniformity of body weight from a flock of 800 birds were slaughtered at 28 weeks of age. Of the 220 birds slaughtered, 110 were prepared full scald and 110 were prepared by the semi-scald method of feather removal.

Processing.--Carcasses at 82° to 87° F. immediately following evisceration were chilled in tap water to 59° F. after which they were trussed and held in a 35° F. room until they reached 50° F. (about 2 hours).

Packaging and freezing.--The full scald and semi-scald birds were wrapped as follows: 36 of each scald with cellophane, 36 of each scald with pliofilm, and 36 of each scald with polyethylene. All of the birds were air-blast frozen in a tunnel at 40° F. The freezing rate for birds in this tunnel was determined with thermocouples placed in two extra carcasses.

Storage.--The frozen, wrapped carcasses were stored in refrigerated and insulated chests all operated at 10° F. and low relative humidity for 24 to 72 weeks.

Results.--Loss of weight was greatest for carcasses wrapped with cellophane, less for those wrapped with pliofilm, and least for those wrapped with polyethylene. Full scalding was a satisfactory

(over)

 ABSTRACTER: Martin Heerdt

3.249 STORAGE OF FROZEN PLAICE FILLETS

Dyer, W. J. and Morton, Margaret L. (Atlantic Fisheries Experimental Station, Halifax, N. S.)
Journal of the Fisheries Research Board of Canada 13, 129-134 (January 1956)

Introduction.--Studies with Atlantic haddock, cod, and halibut have shown that two major changes occur in frozen fillets during storage. These are: (1) a development of toughness as revealed by taste panel evaluation that is related to the amount of protein denaturation; and (2) a development of off-flavors suggestive of fat spoilage.

Experimental.--Commercial fillets from American plaice (Hippoglossoides platessoides) were washed and divided into 2 lots. Fillets from lot 1 were immediately wrapped in cellophane and packed in 5-pound waxed cartons. Fillets from lot 2 were dipped for 1 to 2 minutes in a solution containing 0.3 percent ascorbic acid and 0.5 percent dried Irish Moss gel, drained, wrapped, and packed like lot 1. Both lots were immediately frozen in a plate freezer and then placed in storage at +10° F.

Samples were evaluated at 3-week intervals. For taste testing, frozen samples minus wrappings were placed while still frozen in an oven and baked for 13 minutes at 500° F. Baked samples were scored for texture, taste, odor, and grade, using values of 0 to 5 by people experienced in tasting plaice fillets.

Chemical analyses were made on each raw sample. Actomyosin nitrogen and soluble protein nitrogen were extracted by the method of Dyer et al. (1950) and protein nitrogen was estimated by the biuret method of Snow (1950). A modification of the method of Banks (1952) was used for the determination of fat spoilage (free fatty acid). Peroxide values were determined by a method similar to methods used by Banks (1937) and Tarr (1947). Crude fat was determined by the method of the A. O. A. C. (1950).

(over)

 ABSTRACTER: Martin Heerdt

3.249 MUSCLE TISSUE AUTOLYSIS DURING COLD STORAGE, DEEP FREEZING, AND DEFROSTING

Drozdov, N. S. (Moscow Technol. Inst. Meat and Milk Ind.)
Biokhimiya 20, 403-7 (1955)
Chemical Abstracts 50, 2087 (February 10, 1956)

Methods of investigation were similar to those described elsewhere (C. A. 34, 4127[1]). Beef from cows 4 to 6 years old was used. Hindquarters were cooled to 2 to 4° and 500-600-g. samples removed under sterile conditions and cut into pieces of 150 to 200 g. For control purposes one piece was tested in an unfrozen condition, one piece was frozen to -23° during 3-3.5 hours, one piece (wrapped in Al foil) was cooled to -10° and analyzed at once; other such samples were stored for 2 and 4 months at -10° prior to being analyzed. Evidence of the presence of processes of autolysis was found in all frozen and stored beef samples. Such processes of autolysis were accompanied by the decomposition of the myophosphoric compounds, anaerobic glycolysis, accumulation of lactic acid, amylolytic breakdown of the myoglycogens, and by the formation of reducing types of carbohydrates. After a prolonged period of freeze-storage at -10° there was an accumulation of lactic acid, a lowering in the reducing type of carbohydrates, and a slight increase in the org. P fraction and a simultaneous larger increase in the inorg. P. Some increase in the H_2O-sol. myoproteins was also noted. This was thought to be due to the redistribution in the myoprotein fractions as a result of the effect of the processes of autolysis on the state of the protein complex of the muscle fibers.

 Reprint in whole

FREEZING IN ALGINATE

PACKAGING FROZEN POULTRY

CHANGES IN FROZEN PLAICE

TISSUE AUTOLYSIS DURING COLD STORAGE

3.238

practice of feather removal if stored carcasses were wrapped with polyethylene or pliofilm. Full-scalded and semi-scalded carcasses wrapped with polyethylene were equally attractive in appearance after one year of storage at 10° F. Low initial bacterial counts and a decrease in numbers of bacteria present during storage showed that the process was bacteriologically practical. Scald treatment, wrapping material, and time in storage did not affect the palatability of the meat. A progressive and consistent increase in peroxide value during storage did not result in any marked deterioration of the fat, even at the end of 72 weeks. The fatty acid content of the carcass fat was not indicative of severe deterioration as a result of the kind of scald, kind of wrapping material, or the time in storage.

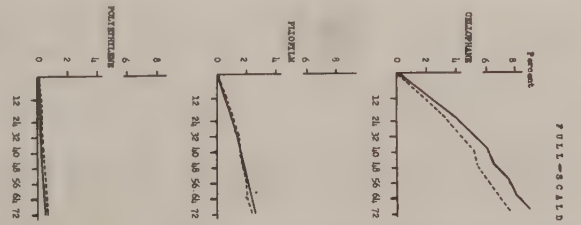


Figure 3. Shrinkage of poultry during storage for full scald treatment, wrapping material and storage time.

Solid line _____ The wrapping material tested separately (chests 1, 2 and 3).
Broken line- - - - - -The three materials stored together (chest 5).

3.238

Jelly forms film. --The alginates are able to build solutions of high viscosity with water, to form a film around the fish. Thus the alginate jelly prevents oxidation. The blocks can be frozen in cartons which are not necessarily waterproof. The fish can be packed in layers in flat cartons and the cartons can be handled and frozen in multiple plate freezers. Another advantage is that the time of freezing is considerably shortened as the insulating airpockets are filled with alginate jelly. During thawing, frozen blocks still keep their shape, even above 0° C. and are protected against oxidation by air.

Useful for bait freezing. --The first problem that had to be solved and which gave the push for experimentation, was freezing herring for bait. In Norway there is a demand for bait with a high fat content. Experiences thus far show that "alginate"-frozen herring is preferred by fishermen who have had the opportunity of trying it. Two months old samples are said to be equal in quality to fresh herring. "Alginate"-frozen herring is easier to handle and store and stays bright without any drying of the skin.

Applicable to canning. --Extensive research work has already been performed in testing the technical and chemical qualities of the Protan-method. The Norwegian Governmental Research Institute at Bergen stated that test pieces of herring-fillets frozen in alginate jelly, and stored for 6 1/2 months did not show any sign of rancidity, the peroxide-value being below 1.

Comparative tests with round herring, frozen respectively in alginate-jelly, fresh water, sea water, weak glycerine solution, and without water, showed after 7 months storage at -20° C. that the alginate-jelly and fresh water samples were decidely the least rancid. Alginate-treated fish that were smoked after 12 months of storage showed excellent color, taste and consistency. The method is very simple in operation because ordinary plate-freezers can be used. The cost of Protan-powder is low and not prohibitive. The Protan method of fish freezing is said to insure a high quality product. In Norway, it has stimulated the sale of fish.

3.249

3.249

Results. --The stored fillets contained 83 percent moisture, 2.3 percent total nitrogen, 0.35 percent non-protein nitrogen, 0.5 percent "albumin" nitrogen or one-fourth of the total protein nitrogen. These amounts remained constant throughout the storage period.

The texture and flavor of the fillets remained constant for about 6 to 10 weeks and then declined fairly rapidly up to the twenty-eighth week. Thereafter, texture changed very little, whereas the flavor dropped rapidly up to 32 weeks when it leveled off at about 45 percent of the original. Plotted values for the average grade follow the flavor scores very closely. At 32 weeks the samples became unacceptable owing to off-flavors indicative of fat spoilage, some toughening, and poor appearance.

Changes in soluble actomyosin were parallel to the soluble nitrogen curves. The apparent agreement between the protein extractability and the texture values indicates that protein solubility may be usable as a storage quality index. Crude fat ranged from 1.1 to 1.9 percent, and free fatty acid, expressed as oleic acid in the extracted fat, gradually increased until 25 weeks and then leveled off at 30 to 40 percent. The perioxidevalues obtained were of doubtful significance.

Conclusions. --Plaice fillets wrapped and packed in waxed cartons, frozen, and stored at +10° F. remained palatable for about 6 months as compared with cod and Atlantic halibut, which remained palatable for 2 to 3 and 8 months, respectively. Ascorbic acid treatment did not appear to be effective in this experiment. The findings suggest a relationship between protein denaturation and lipid content and its deterioration.

3.238 FOODS AND PERMEABILITY

Charlton, F. S. and DeLong, R. F.
Modern Packaging 29, 227-235, 342-344 (March 1956)

Permeability, in its broadest sense, is the passage of liquids, gases, vapors, and electromagnetic waves through protective films. Permeability is evaluated by the use of principles involving the association of one gas with another through a standard sheet. The Davis method, which utilizes the partial pressure differentials of a test gas between two sides of a film, was used to attain most of the data in this paper.

Permeation is dependent upon the solution of water vapors or gases in the film or its plasticizers, migration through the sheet and evaporation from the opposite side or upon the transmission of water vapors or gases through pores or interstices in the film itself. Aluminum foil, where permeability is essentially due to the existence of small pores in the sheet, is an example of the latter.

In synthetic organic films an increase in film thickness will result in decreased permeability. However, the value of zero permeability is approached only asymptotically as a limiting value. It is evident that as a film's caliper increases beyond a certain value, it becomes uneconomical to increase it further to obtain lower permeability.

Atmospheric humidity may influence the gas permeability of a film. The gas transmission rate for cellophane is increased by raising the humidity. However, polystyrene, polyvinyl alcohol and polyvinyl butyral are relatively unaffected by humidity.

Permeability increases with an increase in temperature. The effect of temperature on CO_2

(over)

 ABSTRACTER: Donald C. Malins

4.11 THE REACTION OF TORTELLI-JAFFE FOR THE IDENTIFICATION OF FISH OILS

Bigoni, Giuseppe (Lab. Gaslini, Genoa, Italy)
Olii minerali, grassi e saponi, colori e vernici 32, 193-4 (1955)
Chemical Abstracts 50, 4531 (March 25, 1956)

The reaction of Tortelli-Jaffe and its modification by Tosonotti (to 2.5 cc. oil or melted fat, add 2.5 cc. dichloromethane, 8 drops 99 percent formic acid, shake, and add 5 drops liquid Br) are not specific for the fish oils, because some compds. found in the unsaponifiable fraction of the rectified olive oils give colored reactions very similar to those given by fish oils, while the unsaponifiable matter of the latter gives a very different reaction.

 Reprinted in whole

3.39 SPOILAGE OF COMMERCIALLY CANNED FISH

Venkataraman, R. and Sreenivasan, A. (Fisheries Technological Station, Kozhikode)
Journal of Scientific and Industrial Research 14A, 480-482 (1955) (Reprinted)

Large quantities of canned mackerel and sardines produced by a local cannery developed swelled cans. The factors responsible for this spoilage were examined.

Canning procedure.--Fresh mackerel and sardines caught near the shore were landed at the cannery within a few hours after capture. These fish were gutted and washed in potable water, brined for one-half hour in 15° Bé. brine, and spread on grills in the sun for one hour to dry. The fish were then fried in boiling peanut oil, placed on grills, and arranged on racks to drain off excess oil. The fried fish were packed in flat cans with a few pieces of pepper, cloves, and bay leaves or essence of bay leaves. The cans were then filled with oil, double seamed, autoclaved for one hour at 239.5° F., cooled in water, washed, dried, and placed in storage.

Bacteriological examination.--The cans were aseptically opened in the laboratory after their surfaces had been sterilized. Dilutions for plating were made with thioglycollate broth and inoculations were made into Brewer's thioglycollate agar, sulphite agar (for thermophilic anaerobes producing hydrogen sulphide), cooked meat medium (for gas-producing anaerobes), glucose agar 'deep', and semi-solid agar. The plates were incubated in Fieldes' anaerobic jars. Pure discrete colonies were subcultured in semi-solid agar medium containing sodium thioglycollate. Fermentation of sugars, production of indole, reduction of nitrates, and other tests were studied in the same medium by using test sugars, Audrades' indicator, and other substances.

Results and discussion.--The mesophillic bacterial count at each stage in the canning of sardines

(over)

 ABSTRACTER: Martin Heerdt

4.20 OIL RESEARCH PROJECT AT THE SEATTLE TECHNOLOGICAL LABORATORY

Sumerwell, William N.
Commercial Fisheries Review 17, 14-17 (December 1955)

There are a variety of known reactions that can be applied to fish oils and it is the object of the oil research project of the Seattle Technological Laboratory to select some of these reactions, apply them to fish oils, and study the properties of the products obtained.

Modification of marine oils can be brought about in two major ways: (1) by modifying the carboxylic group of the fatty acids to produce such substances as long-chain alcohols, halides, and siloxanes; (2) by oxidizing or adding chemical groups to the double bonds of the unsaturated fatty acids to produce such compounds as, dicarboxylic acids, polyhalides, and polyamino acids.

A second objective of the Seattle project is to determine some of the more common chemical and physical constants of the products prepared. A third objective of the project is to carry out separations of the marine-oil fatty acids and their derivatives by means of such techniques as vacuum distillation, fractional precipitation, and inclusion-compound formation.

The first group of compounds studied was the long-chain alcohols. The sodium reduction method was used in this work. This procedure involves the suspension of finely-divided sodium in boiling xylene. To this suspension, a mixture of the fatty acid ester (either glyceride or methyl ester), the reducing alcohol (2-methyl-4-pentanol), and xylene is added at a controlled rate of flow. The reaction mixture must be well agitated so that the sodium particles can react with the fatty-acid ester and reducing alcohol. After the addition is completed, the reduction mixture is agitated at reflux temperature for an hour and is then slowly poured into a hydrolysis and steam-distillation apparatus. The

(over)

 ABSTRACTER: Edward H. Gruger, Jr.

VAPOR PERMEABILITY OF FILMS

CANNED MACKEREL SPOILAGE

IDENTIFICATION OF FISH OILS

FISH OIL RESEARCH

3.39 (Cross Reference: 0.5)

was, for whole fresh fish, gutted and washed fish, brined fish, fried fish, and heat-processed fish, respectively, 166,000, 34,000, 3,700, 300, and 0 bacteria per gram of fish. The results of the examination of mackerels and sardines canned in 1953 are presented in table 1, omitted.

Bacteriological examination of cans of swelled mackerel revealed that the causative organism was Clostridium parasporogenes, which digested cooked meat partially but rapidly with blackening and production of gas and foul odor, liquefied coagulated white of egg and gelatin, and completely digested purple milk and reduced the dye.

4.20

long-chain alcohols are liberated from the reduction mixture by hydrolysis, and the reducing alcohol and xylene are removed by steam distillation.

The details of the sodium reduction were worked out by preparing cetyl alcohol from methyl palmitate, octadecyl alcohol from methyl stearate, and oleyl alcohol from methyl oleate. The reaction was applied to the natural glycerides of menhaden and pilchard oils. The crude alcohols were obtained in 85 to 90 percent yield. The alcohols were separated into saturated and unsaturated fractions by precipitation from acetone at -18° C. These fractions are being separated further by fractional distillation and urea-inclusion compound formation.

Long-chain alkyl halides have been prepared from cetyl, octadecyl, and oleyl alcohols. Several methods for preparing these halides have been studied. They involved the use of hydrogen halide acids, thionyl chloride, and phosphorus trihalides. It appears difficult to prepare unsaturated alkyl halides, owing to the reactivity of the double bonds. However, oleyl bromide and oleyl chloride have been made.

The long-chain alkyl halides are being used to prepare long-chain alkyl silicone polymers. A typical method is described for the preparation of cetyl silicone polymer. Cetylbromide, distilled at 197° to 203° C. at 21 mm. of mercury was reacted with magnesium in dry ether to form a Grignard reagent. The Grignard reagent was added with rapid stirring to an ethereal solution of silicon tetrachloride, precooled to 0° C. The main product from this reaction was cetyl dichlorosilane, which was distilled off. The cetyl dichlorosilane was hydrolyzed by pouring over cracked ice. After the hydrolysis was complete, the cetyl silanol, which had precipitated as a white, amorphous solid, was filtered off and dried in vacuo. The dried silanol was then polymerized by heating in a vacuum oven at 90° C. for 18 hours. The product was a tan-colored solid.

3.238

permeability is illustrated with respect to polyethylene, cellulose acetate, pliofilm and mylar polyester.

Solution permeability is of prime importance in flavor and odor permeation. Data on the permeability of polyethylene, regenerated cellulose, cellulose acetate, vinyl chloride, and acrylonitrile by benzene, ethanol, ethyl acetate, and water is presented.

A film possessing undesirable permeability characteristics may be modified by coating and lamination. Data on wax-coated and laminated films is presented together with permeability comparisons of cellophane PT, cellophane MSAT, aluminum foil, glassine, pliofilm NO, polyethylene, mylar A, saran and cellulose acetate with respect to WVP, O_2, and CO_2.

Transparent films are permeable to a wide range of light wavelengths. It was considered feasible to package meat or cheese in a film which would be permeable to the ultraviolet wavelength of 2537A° so that bacterial contaminants would be lessened. The transmission of ultraviolet light at this wavelenght through various films of given thickness was measured and is presented.

A study of rancidity in potato chips revealed that when colored cellophanes were used to contain this product there was a reduction in the development of rancidity as determined by a taste panel.

Grease and oil permeability is measured by the amount of time between the application of grease or oil to one side of the material under test and the first visual evidence of penetration of the substance into the packaging material sheet. Grease penetration of cellulose-based packaging materials proceeds by both pinhole permeation and capillary wicking action along the fibres. Highly hydrated glassine is relatively free of pinholes and provides excellent resistance to grease permeation. Regenerated cellulose and parchment are also highly resistant to greases. The coating or lamination of a film may often provide added protection against grease permeation.

4.11

4.62A UNSATURATED LIPIDE OXIDATION CATALYZED BY HEMATIN COMPOUNDS

Tappel, A. L. (Department of Food Technology, University of California, Davis, California)
The Journal of Biological Chemistry 217, 721-733 (December 1955)

Experimental.--The preparation of solutions of hemoglobin and myoglobin was carried out with the removal of hemoglobin from myoglobin by a method of differential heat denaturation. The latter involved heating the myoglobin solution to 60° for 10 minutes. The myoglobin was assayed spectrophotometrically to determine when it was free of hemoglobin. Emulsions of unsaturated compounds was prepared. Unsaturated compounds used in the rate of oxidation studies by hematin were as follows: linseed alcohol, conjugated linoleic acid, squalene, tetralin, cyclohexene, cumene, p-cymene, and sorbic acid. Colloidal linoleate peroxide was prepared by the oxidation of colloidal linoleate at 0°, catalyzed by soybean lipoxidase. Larger quantities of linoleate peroxides were prepared by autoxidation of 60 percent linoleic acid at 40° in the dark to peroxide levels of 500 m. eq. per kilo.

Studies of hematin destruction during the catalysis of peroxide decomposition were made on the hematin which remains dissolved in a chloroform layer after an iodometric determination of peroxides. The hematin was measured colorimetrically.

Author's discussion.--The critical part of the mechanism of hematin compound catalysis of lipide oxidation is the initiation reaction in which free radicals are formed. Initiation involves the reaction of a hematin compound with a lipide peroxide to form an intermediate complex and the subsequent decomposition of the intermediate complex into free radicals. This research and others have shown that hematin, cytochrome c, metmyoglobin, hemiglobin, and many of their derivatives are powerful catalysts for the oxidation of a wide variety of unsaturated lipides and other peroxide forming organic compounds. The iron porphyrin and the peroxide group are the essential reactants. The probable

(over)

 ABSTRACTER: Edward H. Gruger, Jr.

4.62B UNSATURATED LIPIDE OXIDATION CATALYZED BY HEMATIN COMPOUNDS

Tappel, A. L. (Department of Food Technology, University of California, Davis, California)
The Journal of Biological Chemistry 217, 721-733 (December 1955)
(Continued from Card 4.62A)
compounds may be produced during hematin catalysis by reactions involving decomposition of the interiron porphyrin-linoleate peroxide with concurrent scission of the —O—O—bond of the peroxide and a —C—C—bond or a —C—C—bond in the linoleate chain. Spectrophotometric measurements indicate that linoleate peroxide decomposition does involve scission of the carbon chain at the double bonds.

The destruction of the hematin catalysts which occurs during linoleate peroxide decomposition and during the subsequent linoleate oxidation is probably caused by a random reaction of the hematin compound with a free radical. Because of the high reactivity of the free radical intermediates, many nonspecific cooxidations can be expected to occur during hematin catalyzed lipids oxidation.

The evidence presented in this research against a valence change in the iron strongly suggests that the iron porphyrin-lipide peroxide formation and subsequent decomposition involves no compulsory valence changes.

Two types of reaction inhibition have been observed which gives information relative to the bonding of lipide peroxides to hematin compounds.

 ABSTRACTER: Edward H. Gruger, Jr.

6.15 FISHERY BYPRODUCTS --LIQUID FISH MEAL

Gunasekera, C. and Lantz, A. W. (Fisheries Research Station, Ceylon)
Progress Reports Biological and Technological, Fisheries Research Station, Colombo, Ceylon, No. 1, 7-10 (July 1955)

Objective.--The purpose of this investigation was to determine whether local varieties of fish could be acid digested to produce a stable quality liquid fish meal.

Experimental.--A ray (Dasyatis) and a candil (Myripristis murdjan) were minced, the resulting minced flesh was adjusted to pH 4.5 with 85 percent formic acid. Digestion of the minced flesh was allowed to proceed at room temperature until the mixture began to spoil. Tests showed that additional formic acid (36 to 63 percent acid by weight) and a pH of 2 or 3 was necessary to prevent spoilage during digestion. Analysis of the original raw fish and of the final liquid on a dry-weight basis showed no reduction in protein content as a result of the acid treatment.

Acid requirements.--Clouded bream (Lethrinus nebulosus) was selected to determine the smallest quantity of acid necessary for proper digestion. Strong formic acid was added to minced samples of whole fish in an amount equivalent to 0, 2, 4, 6, 8, 10, 20, 30, 40, and 50 percent of the original volume of the mince. Water was added in variable quantities to keep the mixtures at roughly uniform consistencies after digestion. All samples above 6 percent acid were stable and were apparently satisfactory although the pH values varied from pH 2 to 6.

Water requirements.--Six to 10 percent acid samples were prepared and water was added in amounts equal to 0, 10, 20, 30, 40, and 50 percent of the original volume of the mince. When too little water was used the meal separated in small masses which had a tendency to decompose, whereas too

(over)

 ABSTRACTER: Martin Heerdt

6.55 STUDIES ON THE PRODUCTION OF FERMENTING FISH SILAGE

Kreuzer, R.
Arch. Fischereiwiss 4, 57-69 (1952-53) and 5, 47-48 (1954) (Summary in English 69)
Food Science Abstracts 27, 134-135 (March 1955)

In experiments on the formation of acid in fermenting fish silage, it was found that a pH of 4.5 should be achieved as rapidly as possible. Up to a certain point the acid formed is bound to fish protein; but beyond that, considerable amounts of acid begin to accumulate in the silage fluid. The optimum temperature for bacterial growth is 23° to 25° C. The initial bacterial count determines the course of acid formation; even at higher temperatures (25° C), the bacterial count should be 100 to 200 million per ml. of fluid. The activity of the lactic acid bacteria is the decisive factor in the rapid and continuous production of acid. Lactic acid can be added when pH 4.5 has been reached, or after the termination of fermentation; it should be added only to satisfactory silages, however.

The breakdown of sugar and the behaviour of proteins and volatile bases were investigated during the growth of bacteria in fish silage acidified by bacterial action, at 20° C. At that temperature, bacterial growth is slower than at 25° C, but sufficient acid is formed to produce the required acidification, provided that the initial number of lactic acid bacteria is adequate. Sugar utilization at 20° C is unfavorable; up to pH 4.08, about 12% of sugar was used up, compared with only 4.8% at 25° C. The fermentation of fish silage should be carried out at temperatures which are near the optimum for the lactic acid-producing organisms, e.g. at 25° to 30° C with Lactobacillus plantarum. During ensilage for 15 to 23 days, the nitrogen content of the silage increased slightly at 20° C, and the content of free amino acids also increased. After 15 to 23 days, the content of volatile bases was 94 to 124 mg per 100 g; amounts greater than that usually indicated infection with undesirable organisms.

 Reprinted in whole

HEMATIN AND FAT OXIDATION (Card 1)

HEMATIN AND FAT OXIDATION (Card 2)

LIQUID FISH MEAL

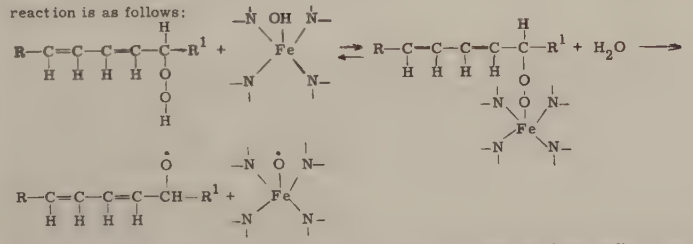
MANUFACTURE OF FISH SILAGE

4.62B

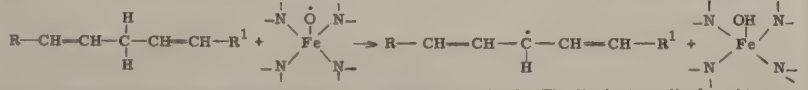
6.55

4.62A

reaction is as follows:



The reaction between linoleate peroxide and hematin to form the intermediary complex is probably reversible, as are reactions of simpler peroxides with hematin compounds. Since the—O—O— bond of the iron porphyrin-peroxide is the weakest, the initial scission undoubtedly occurs here. In the presence of excess linoleate the hematin radical can abstract an activated methylene hydrogen,



regenerating the original hematin and producing a linoleate radical. The linoleate radical could cause free radical chain reaction propagation. Other reactions of free radicals are possible, and the pathways taken would depend on the environmental conditions existing during the reaction. Carbonyl

(Continued on Card 4.62B)

6.15

much water caused the meal to separate into a solid layer and an aqueous layer. This separation slowed down the digestive process. Samples containing 30 and 40 percent water were the most satisfactory as they formed stable homogeneous mixtures in 3 to 4 weeks.

Mincing hastens digestion.--Digestion ordinarily occurs in from three days to four weeks, but the time for digestion can be reduced by finely grinding the fish. Each sample was divided into three portions one of which was finely ground in a "Waring Blendor", another was ground in a household mincer, and the third coarsely ground with a mortar and pestle. The most coarsely ground sample took 1 to 10 days longer to digest than the medium ground sample and the medium ground sample took 3 to 8 days longer to digest than the finely ground sample.

"Meals" from other fish.--A ray and candil were tested again using 5, 10, 15, 20, 25, 30, 40, and 50 percent acid respectively. Candil was found to require 40 percent acid and 6 weeks time for complete digestion. The liquid portion from the 5 percent acid mixture when decanted after 2 weeks from undigested spines and scales was found to be a stable homogeneous concentrate. Similar results were obtained with mixtures containing 10, 15, 20, 25, or 30 percent acid. The spines and scales from these species must therefore be discarded or treated separately.

Similar experiments showed 5 percent acid and 33 percent water sufficient to digest perch (Ephippus orbis), in 1 week; mackerel (caranx chrysophrys) in 2 weeks; butterfish (Seriola nigrofasciata in 4 days; barracuda (Sphraena jello) in 3 days; and snapper (Lutianus lutianus) (except for bones and scales) in 4 days. All of the concentrates proved stable and seemed to be completely satisfactory.

Yield and quality.--Tests indicated that there was no loss in protein, fat, or ash in the digestion process. Any loss in weight during digestion can be made up by adding water. A specimen liquid meal contained about 18 percent protein, 78 percent moisture, 1.5 percent ash, and 2.5 percent fat. The food value of liquid meals is equivalent to that of the material originally minced.

6.19 CELLULOSE DIGESTION BY RUMEN MICRO-ORGANISMS AND ITS STIMULATION BY FISHERY BYPRODUCTS: II. PREPARATION OF AN ACTIVE WASHED INOCULUM AND THE DEVELOPMENT OF A CHEMICALLY DEFINED FERMENTATION MEDIUM

Murray, J. F. and MacLeod, R. A.
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 104, 23-25 (November 1955)

Cellulose digestion by rumen micro-organisms was previously shown to be stimulated by fishery byproducts. Most of the response was apparently due to the amino acid content of the fishery by-products, but there are indications that other factors may be present and capable of stimulating cellulose digestion. If the presence of these factors were established, increased use of fishery products in feeds for ruminants probably would result.

A method developed to prepare an active washed inoculum of rumen micro-organisms was described. The activity of inocula was checked by determining the time required for a given volume of inoculum to reduce the dye triphenyltetrazolium chloride under standard conditions. A relation was established between reduction time of the inoculum and its ability to digest cellulose. If the reduction time of an inoculum did not fall within selected limits, it was not used in an assay.

The basal medium contained a complex mixture of inorganic salts, urea as a source of nitrogen, and cellulose parchment as a source of energy. Cellulose digestion was measured by the difference between the weight of the parchment at the beginning and the end of the experiment. Cellulose digestion was stimulated by reducing agents, readily fermentable carbohydrates, short chain fatty acids, and a mixture of nine vitamins of the B complex. The greatest response was obtained when a mixture of

(over)

 ABSTRACTER: Neva L. Karrick

6.51 FOURTH PROGRESS REPORT ON SALMON DIET EXPERIMENTS

Wood, James W.; Hublou, Wallace F.; McKee, Thomas B.; Sinnhuber, Russell O.; and Law, Duncan K. (Fish Commission of Oregon, Portland)
Research Briefs 6, 29-32 (November 1955)

Objective.--Six diets, each containing 2 percent salt (NaCl), were evaluated for raising spring chinook salmon (Oncorhynchus tshawytscha).

Experimental.--Six 25-foot-diameter concrete ponds containing water at 37° to 40° F. were used. Each pond contained 7,100 salmon of a size that averaged 62 salmon per pound initially. The diets contained salmon (O. tshawytscha) flesh, shad (Alosa sapidissima) flesh, salmon viscera, salmon meal, wheat-germ meal, Argentine beef-liver meal, and beef liver.

Diet materials further identified as to their origin were (1) beef liver--undenatured fluky beef liver obtained from an Astoria, Oregon packing house, (2) salmon flesh--coarse-ground carcasses of spawned-out chinook salmon frozen in 50-pound boxes, (3) salmon viscera--viscera without heads, tails, or fins, (4) shad flesh--coarse-ground shad frozen at Bonneville, Oregon. All of the foods with the exception of the dry meals were held in frozen storage.

The daily allotment of food to each diet was computed on a dry-weight basis to be equal to 1 percent of the body weight of salmon receiving the diet. All diets were freshly prepared each morning in part from foods that had been thawed just in advance of their need. All salmon were fed 3 or 4 times daily and 6 days weekly. Afternoon feeding was practiced because the fish were more receptive to food,owing to the increase in water temperature. Portions of the diets unfed at the end of each day were weighed and discarded.

(over)

 ABSTRACTER: Martin Heerdt

6.3 CEYLON MOSS--A MARINE RESOURCE

Durairatnam, M. and Medcof, J. C. (Fisheries Research Station, Ceylon)
Progress Reports Biological and Technological, Department of Fisheries, Colombo, Ceylon, No. 1, 13-16 (July 1955)

Survey.--Commercial quantities of Ceylon moss have been discovered in three principal areas--Kalpitiya, Trincomalee,and Mannar. Two species of seaweed have been identified and their known range is still being extended. The Kalpitiya weed is Gracilaria lichenoides, which, when dried, yields 20 to 25 percent (by weight) of agar comparable to imported Japanese Grade II agar. This seaweed can be gathered in quantity from January to May every year in the shallow waters of Puttalam Lagoon, Dutch Bay, and Portugal Bay by waders who pluck it by hand. Loose plants frequently can be collected on the beach because wave action detaches them.

The Trincomalee form of Ceylon moss is Gracilaria confervoides. Dried samples tested in the laboratory have yielded 40 percent agar with the same characteristics as those of the Japanese Grade I agar. In both 1953 and 1954, Gracilaria confervoides was cast ashore in great windrows in the Mutur ferry district of Koddiyar Bay (not far from Trincomalee) from July to October. Thus far, the beds where this moss grows have not been discovered.

At Mannar, both Gracilaria lichenoides and Gracilaria conferoides are found mixed together. They are cast ashore there from July to October, but the beds have not been discovered.

Drying and bleaching.--Fresh Ceylon moss as it comes from the water or from newly cast-up windrows is present as sodden, greenish-yellow or purple clumps which spoil rapidly unless they are spread out and dried. In practice this seaweed is picked over to remove foreign seaweeds, twigs, and

(over)

 ABSTRACTER: Martin Heerdt

7.47 CANNED FOOD - CHEMICAL EXAMINATION

Anonymous
La revue de la conserve 9, 31 (December 1954)
World Fisheries Abstracts 7, 39 (March-April 1956)

Describes a device for sampling and analysis of the gases in swelled cans. This device includes (see Illus. over) a graduated glass cylinder at the bottom of which is welded a lateral tube with cock; a copper pipe bent twice at right angles and a hollow point of hard steel attached at one end; a plain steel rod with one end fitting exactly with the outside contour of the first right angle bend of the copper pipe; 2 separating funnels, one of which has a cock (S), mounted on a cork which closes the cylinder; the other (B) has no cock and helps to maintain the level in the graduated cylinder liquid; a screw pinch-cock (K); rubber and glass piping. For operation, the apparatus is set as indicated in Fig. 1 (see over). The gases recovered in the graduated cylinder are trapped when placing the cork of S under water. Fig. 3 indicates the set-up for determination and analysis of the gases. The total volume of gas is indicated by an engraved scale on the side of the graduated cylinder. The determinations are made in the following order: Determination of CO_2. Through the funnel S, a concentrated solution of NaOH is introduced in the cylinder; after shaking, a decrease of volume indicates the presence of CO_2. Determination of air (oxygen). Alkaline solution of pyrogallol is introduced in the cylinder and the same procedure followed; a decrease of 1/5 of the volume shows there is air. Determination of H_2S. A solution of lead acetate is introduced in the cylinder. In presence of H_2S, there is practically no change in the volume of the gas but the solution becomes black. Determination of hydrogen. A small quantity of gas is transferred from the cylinder to the test tube for testing the inflammability. Determination of NH_3. NH_3 is water soluble, a portion of the liquid in the cylinder is finally filtered, and the presence of ammonia is detected by means of the Nessler reaction.

(over)

 ABSTRACTER: Jacques Chaux

CELLULOSE DIGESTION IN RUMEN

SOURCES OF AGAR IN CEYLON

SALMON DIET EXPERIMENTS

GAS SAMPLING DEVICE

6.3

extraneous material. The seaweed is then washed and dried. In the dried state the seaweed will keep almost indefinitely,

In Ceylon, drying and bleaching are concurrent. The fresh moss is washed briefly in fresh water, which has been found to be a good conditioner for bleaching (better than sea water), and spread evenly on the ground about three inches deep. It is exposed for three days to strong direct sunlight, which does the bleaching and drying. During this period the moss is turned over several times to insure that the sunlight falls on and bleaches all the spread-out moss evenly. The dampening that the spread-out moss gets at night from the soil or dew (fresh water) is all that is required to bring about thorough bleaching in three days.

Bleached moss has a creamy straw color, weighs about one-seventh of the weight of fresh moss, contains from 10 to 15 percent water, and has a wiry or brittle texture. It can be stored or sold at once to dealers for domestic use or for export.

7.47

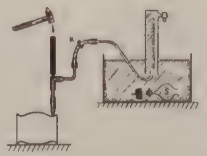


Fig. 1. Assembling the apparatus for sampling.

Fig. 2. Profile of the end of the steel rod (left): side view; (right): front view.

Fig. 3. Setting up for determination and analysis of the gases.

6.19

eighteen amino acids were added. The active amino acids were leucine, isoleucine, and valine.

When the active components were incorporated into the fermentation medium at their optimum concentrations, rapid, reproducible cellulose digestion by washed inocula of rumen-organisms was obtained. The medium of known composition is being used to test the response of rumen micro-organisms to various fishery byproducts.

6.51

Approximately 10 percent of the salmon in each diet group were weighed and counted every two weeks throughout the experiment to obtain the information needed to calculate their gain in weight.

Results.--The percentage gain in weight obtained with each of the diets over an 18-week period from December 7 to April 10, 1951, was as follows: (1) a gain in weight of 21 percent on a diet composed of 98 percent beef liver; (2) a gain in weight of 34 percent on a diet composed of 44 percent salmon flesh, 44 percent salmon viscera, and 10 percent beef liver; (3) a gain in weight of 31 percent on a diet composed of 39 percent salmon flesh, 39 percent salmon viscera, and 20 percent beef liver; (4) a gain in weight of 36 percent on a diet composed of 34 percent salmon flesh, 34 percent salmon viscera, and 30 percent beef liver; (5) a gain in weight of 8 percent on a diet composed of 30 percent shad, 48 percent salmon viscera, and 20 percent Argentine beef-liver meal; (6) a gain in weight of 38 percent on a diet composed of 31 percent salmon flesh, 31 percent salmon viscera, 20 percent beef liver, 12 percent salmon meal, and 4 percent wheat germ.

Salmon that received shad in their diet were sluggish and in poor condition, possibly owing to the presence of the vitamin B_1 destroying enzyme, thiaminase, in the shad.

7.51 PROTEIN QUALITY AND AVAILABLE LYSINE IN ANIMAL PRODUCTS

Carpenter, K. J. and Ellinger, Gabrielle M. (Rowett Research Institute, Aberdeen, Scotland)
Poultry Science 34, 1451-1452 (November 1955)

Objective.--Amino-acid assays of acid hydrolysates of animal products do not always reflect nutritional damage during processing. To learn more about protein quality the authors have compared a biological measure of protein quality with values from a chemical measure. The comparison was made because it is believed to be the ϵ-NH_2 group of lysine that reacts to form a nutritionally-unavailable complex when intact proteins are damaged.

Test method.--A biological method was used for measuring protein quality. This method is (1) based upon the response of chicks when their basal cereal and vitamin mixture, which contributed 8 percent protein, was supplemented with 3 percent protein from the test materials and (2) a modification of the gross protein values (G. P. V.) method.

The chemical method used for measuring protein quality followed the method used to study free-NH_2 groups in purified proteins by their reaction with 2, 4-dinitrofluorobenzene (DNFB) to form stable dinitrophenyl (DNP) compounds.

Experimental.--Suspensions of animal product materials were shaken with DNFB, hydrolyzed with acid, and extracted with ether to remove excess DNFB and DNP-amino acids other than ϵ-DNP-lysine. The extinction of the final solution was measured at 435 mμ. "Available lysine values" (A. L. V.) were then calculated as the weight of lysine that would give the same extinction after complete conversion to ϵ-DNP-lysine. These values are shown in table 1 (see over).

Statistical analysis of the data obtained showed a highly significant relationship between G. P. V. (y) value and A. L. V. (x) values. An estimate of the G. P. V. values of materials of the type tested may be obtained from the regression equation $y = 43.8x - 2.69x^2 - 75.5$ with a standard error of less than ±5.

The data appear to confirm that lysine is usually the critical amino-acid under the conditions of the G. P. V. test.

(over)

 ABSTRACTER: Martin Heerdt

7.595 SORBIC ACID AS FUNGISTATIC AGENT FOR FOODS
X. SPECTROPHOTOMETRIC DETERMINATION OF SORBIC ACID IN FOODS IN GENERAL

Luckmann, Frederick H. and Melnick, Daniel (Research Laboratories, The Best Foods, Inc., Bayonne, N. J.)
Food Research 20, 649-654 (November-December 1955)

The spectrophotometric method of analysis for sorbic acid in cheese has been extended to the analysis of sorbic acid in foods in general. These foods include breads, cakes, spreads for bread, jams, syrups, fruit juices, meats, and other foods that have been supplemented with 0.025 to 0.22 percent sorbic acid. Irrelevant light absorbing materials contributed by the food can be corrected by conducting the same test on the same size aliquot of the control unsupplemented food. Experimental findings indicate the importance of keeping sample size at a minimum and depending upon minimal dilutions for desired sensitivity. If the material to be distilled is above pH 6.0 and is highly buffered it is necessary to adjust the distilland to an acid reaction.

 ABSTRACTER: Martin Heerdt

7.595 SORBIC ACID AS A FUNGISTATIC AGENT FOR FOODS IX. PHYSICO-CHEMICAL CONSIDERATIONS IN USING SORBIC ACID TO PROTECT FOODS

Gooding, Chester M.; Melnick, Daniel; Lawrence, Robert L.; and Luckmann, Frederick H. (The Best Foods, Inc., Bayonne, N. J.)
Food Research 20, 639-648 (November-December 1955)

Commercial purity.--Purity is of major importance in the control of a food additive. Fortunately, commercial sorbic acid is 100.0 percent pure ± 0.5 percent (one standard deviation) calculated to a moisture free basis.

Additive solubility.--Food additives vary in the degree of their solubility in various solvents and food formulations. When the need for using sorbic acid arises consideration should be given to its greater solubility in certain solvents such as ethyl alcohol, acetic acid, and aqueous solutions buffered to pH values above 3.1. The values for the solubility of sorbic acid in given systems limit the amount that may be added in soluble form to certain foods.

Phase preference.--Phase distribution studies show that propionic acid is predominately water soluble, whereas benzoic acid is predominately fat soluble. Sorbic acid, according to the distribution studies, falls between propionic and benzoic acids. The solubility ratio of sorbic acid in fat to sorbic acid in water at room temperature (74° F.) is 3.0. Solutes such as sugar and salt, but not acids, in water will increase this solubility ratio. The lower and more favorable solubility ratio for sorbic acid accounts in part for the more than three-fold greater effectiveness of sorbic acid in comparison to benzoic acid in protecting foods against mold spoilage. A more favorable solubility ratio, however, does not explain the four-fold greater effectiveness of sorbic acid in comparison to the propionates.

(over)

 ABSTRACTER: Martin Heerdt

7.89 DETERMINATION OF FRESHNESS OF FISH MEAT BY RESAZURIN TEST

Uno, Tsutomu and Tokunaga, Toshio
Bull. Hokkaido Regional Fish. Research Lab. 11, 78-81 (1954)
Chemical Abstracts 49, 9184 (July 10, 1955)

The freshness of fish meat can be detd. by the resazurin color reaction in which blue-violet is gradually reduced to pink (resolfin) or colorless (hydro-resolfin). At pH 6.2-6.8, the decoloration of resazurin corresponds to the deterioration of fish meat, but above pH 7.0 its discoloration was too slow and below pH 6.0 too rapid to compare with the color reactions. In the presence of bacteria, the speed of the resazurin color reduction was rapid when the pH value of fish meat did not change.

 Reprinted in whole

ASSAY OF PROTEIN QUALITY

SORBIC ACID AS FUNGISTAT

SORBIC ACID FOOD PRESERVATIVE

RESAZURIN TEST FOR FRESHNESS

7.595 (Cross Reference: 3.12)

Table 3

Phase distribution studies[1] with fungistatic acids

Fungistatic acid	Concentration in			Distribution ratio, b/a
	Original aqueous phase	Extracted aqueous phase (a)	Vegetable oil phase (b)	
Sorbic	0.160	0.040	0.120	3.0
Benzoic	0.320	0.045	0.275	6.1
Propionic	0.280[2]	0.240	0.040	0.17

[1] Equal parts by weight of limpid vegetable oil and distilled water solutions of the fungistatic acids shaken together (system at 74° F.).

[2] Whereas the values for sorbic acid and benzoic acid concentrations in the original aqueous phases represent maximal solubilities, this value for the highly water-soluble propionic acid was arbitrarily selected.

Application by sublimation.--Sorbic acid sublimes with ease at elevated temperatures. When other means of application are not practical a flash heating method can be used as a means of applying sorbic acid. Foods with irregular external surfaces or configurations that cannot be conveniently placed in intimate contact with a sorbic acid treated wrapper can be protected by subjecting them to gaseous sorbic acid prior to wrapping or packaging.

7.89

7.51 (Cross Reference: 6.191)

Table 1.--Results of tests for protein quality

Sample Description	"Available lysine" value (A.L.V.) gm./16 gm. N	Gross protein value (G.P.V.) Determined	Gross protein value (G.P.V.) "Estimated"
A. Fish products			
Cod fillets, vacuum-dried	8.0	102	103
Cod fillets, vacuum-dried	8.0	104	103
Fish waste, acetone-dried	7.1	103	100
Herring meal, steam-dried	7.0	98*	99
Herring meal, flame-dried	6.0	93*	90
White fish meal	6.3	96	94
White fish meal	5.8	91	88
Pilchard meal	4.8	72	73
Condensed herring solubles	4.2	67*	61
B. Whale products			
Meat meal, vacuum-dried	6.8	96	98
Meat meal, flame-dried	7.0	95	99
Grax meal	6.6	96	96
Meat-and-bone meal	4.5	60†	67
Condensed solubles	4.2	56	61
C. Other materials			
Casein, alcohol extracted (reference standard)	7.1	100	100
Casein	7.0	100	99
Slaughter house meat-and-bone meal	4.0	57	57
Gelatin, commercial	3.7	52	50

* Result from single trial only.

† Not obtained by the standardized technique.

7.595 (Cross Reference: 3.12)

8.6 VITAMINS IN NORWEGIAN FISH II. VITAMINS IN THE VARIOUS ORGANS OF TUNA (THUNNUS THYNNUS) CAUGHT OFF NORWAY'S WEST COAST

Braekkan, Olaf R.
Report on Technological Research Concerning the Norwegian Fish Industry 3, 1-18 (1955)

Fresh samples of different organs from tuna fish (Thunnus thynnus) were collected during the summer of 1952. The samples represented from 100 to 150 fishes and were minced and stored at -15° C. during the investigation.

Niacin, riboflavin, pantothenic acid and vitamin B_{12} were determined by microbiological assays, and thiamine and vitamin A by physical-chemical methods.

The results are summarized in tables 1 to 8, which have English subtitles.

The liver showed extremely high values for vitamin B_{12}, and high values for riboflavin. Meat from tuna fish is a very good source of all the vitamins investigated.

The table on the back of this card is a summary of tables 1 to 8 included in the text of this pamphlet.

(over)

 ABSTRACTER: Kathryn L. Osterhaug

9.7 FAO/ETAP INTERNATIONAL TRAINING CENTRE FOR FISHERY ADMINISTRATORS, DENMARK

Anonymous
F A O Fisheries Bulletin 9, 23-26 (January-March 1956)

The FAO/ETAP International Training Centre for Fishery Administrators, conducted jointly by the Government of Denmark and FAO, was held in Copenhagen from August 29 to October 8, 1955.

Twenty-one government fishery administrators, representing the following 18 countries and territories in the Near East, Mediterranean and Central Africa attended: Egypt, Ethiopia, Iran, Israel, Italy, Jordan, Portugal, Somalia, Sudan, Turkey, Yugoslavia, Aden, Gold Coast, Malta, Nigeria, British Somaliland, East Africa, and Uganda.

The instructors comprised a large and experienced group representing various Danish fisheries institutions, services and commercial associations, a number of distinguished experts from neighboring countries, and several FAO staff members.

The aim of the course was to provide a comprehensive groundwork of knowledge and understanding of fisheries problems, of the responsibilities assumed by governments in regard to the fisheries industries and their development, as well as an understanding of the methods, equipment and training involved in the modernization and improvement of fisheries undertakings.

A series of lectures was delivered covering the principles and practices in public fisheries administration; the aims and methods of modern applied biological, economic, and technological research in fisheries; and organization and methods in commercial practice. The lectures were

(over)

 ABSTRACTER: Kathryn L. Osterhaug

9.4 FISHING INDUSTRIES RESEARCH INSTITUTE

Dreosti, G. M. (Fishing Industries Research Institute, Portswoord Road, Capetown, South Africa)
Food Science Abstracts 27, 486-488 (September 1955)

Organization.--The Fishing Industries Research Institute was established in September 1946. Its annual income is derived as follows: one-half from the guaranteed voluntary contributions of 56 member firms engaged in fishing and fish processing and the other half from the Council for Scientific and Industrial Research; another 62 firms indirectly connected with the fishing industry subscribe additional sums to the Institute's research funds as Associate Members.

Scope.--The work of the Fishing Industries Research Institute is as follows: (1) to conduct applied and fundamental research into problems affecting the fishing industry; (2) to provide technical advisory services on special problems concerning individual member firms; (3) to provide members with information regarding the latest scientific and technical developments in the fishing industry throughout the world; (4) to test new methods and equipment and to advise on their suitability under South African conditions; (5) to conduct routine inspections for quality on products intended for special export markets; and (6) to conduct routine chemical, physical, and microbiological analyses on commodities used or produced by the industry. Services under 2, 5, and 6 are at the expense of the individual member who requests them.

Activities.--Current fresh fish research at this institute is concerned with a satisfactory objective test for freshness, improved methods of chilling and of preserving and storing chilled fish, and improved methods of distribution to inland markets. A recent advance made by the Institute in the methods of handling trawl-caught fish at sea is a fish flume that converts batch handling into continuous handling of fish on deck. The handling system also provides for washing, faster icing of fish in the hold, and a reduction in the time that gluts remain exposed on deck. Studies in progress to extend the storage life of fresh hake are concerned with the bacterial load of the fish itself, the use of preservatives such

(over)

 ABSTRACTER: Martin Heerdt

VITAMINS IN FRESH TUNA

SOUTH AFRICA FISHERY RESEARCH

INTERNATIONAL FISHERIES TRAINING

9.4 (Cross Reference: 1.016)

as salt and various antibiotics, and the physics, chemistry, and microbiology of ice. Fish preservation studies include such problems as the rate of striking and drying of salt fish, the microbiology of salt, and optimum conditions for freezing and storing frozen fish.

Trade in frozen rock lobster tails has increased fourteen fold in less than 10 years at least in part because of studies made to improve frozen quality and to extend frozen storage life. When Institute studies indicated the particular importance of rapid freezing, a new type of blast freezer was designed for freezing lobster tails six times as fast as they were being frozen on pipe coils.

Studies in regard to the tenderness of canned pilchard have established two reasons for the development of a condition known as "mush". One reason is the presence of too large a headspace in the can; the other is a precanning fish condition known as "pap"-ness. "Pap" fish, which are nearly always present in small quantities, increase in number during certain parts of the canning season.

A rapid method for the determination of fat in fish meal, which ordinarily requires 8 hours by standard analytical methods, was recently developed by the Institute. Fat analyses can now be made simply in the laboratory or in the meal factory in about 15 minutes with better reproducibility than by the standard method.

Marine products such as fish and rock lobster meals, fish flours, and concentrated fish solubles are often used in the manufacture of mixed animal feeds. An investigation of the nutritive value of these products by chemical, microbiological, and animal assays is a part of the program of the Institute.

8.6 (Cross Reference: 1.1, 2.9, 6.190)

Proximate Analysis and Vitamin Content of Tuna Organs

Sample of	Total dry matter %	Protein %	Fat %	Ash %	Pantothenic acid μg/g	Niacin μg/g	Riboflavin μg/g	B_{12} μg/g	Thiamine μg/g	Vit A I.U./g
Liver	32.1	16.2	13.5	1.35	25.4	88.0	44.8	3.53	4.17	13,400
Pyloric caeca	33.0	13.4	18.2	1.22	11.9	33.2	3.2	0.17	2.67	800
Stomach	24.6	21.2	1.66	1.16	6.4	29.9	2.4	0.10	3.71	
Intestines	22.7	17.5	2.85	1.62	9.8	25.5	3.4	0.26	3.00	84
Spleen	24.8	18.9	3.00	2.37	6.9	46.4	2.4	0.35	2.17	
Kidneys	24.3	16.8	5.85	1.48	18.4	53.0	8.1	0.35	4.50	360
Heart, ventricle	25.8	20.6	2.63	1.31	23.2	67.5	10.0	0.87	7.19	
Heart, auricle	21.9	17.1	2.70	1.14	19.7	55.0	6.9	0.82	6.04	
Gills	23.7	14.4	4.22	4.33	4.8	17.4	1.8	0.070	1.05	
Ovaries, immature	30.8	16.4	13.1	1.37	19.4	17.7	13.2	0.082	1.31	
Testis, immature	67.8	3.25	63.4	0.54	13.4	10.1	1.0	0.023	1.46	
Meat, back	32.8	25.2	6.9	1.23	6.1	105.7	1.6	0.049	1.63	
Meat, belly	34.6	25.6	8.7	1.1	9.0	110.0	2.1	0.050		
Meat, tail	34.0	23.8	10.5	1.1	7.6	35.9	1.8	0.068		
Meat, dark	32.2	23.0	8.0	1.2	31.6	91.2	7.1	0.31	3.4	
Meat, neck	36.5	21.5	14.6	1.06	4.4	84.4	1.0	0.037	2.10	10

9.7 (Cross Reference) 1.01)

illustrated by an extensive series of demonstration visits to fishing ports, markets, processing plants, public authorities, and ancillary undertakings, where the structure and operation of the fish trade were observed and explained. The visits included a two-weeks' tour of fishing centers in Jutland, during which several voyages were made in commercial fishing craft and research vessels.

1.50 QUALITY OF SEA-FROZEN COD

Anonymous
Food Manufacture 29, 435-436 (November 1954)

(Abstract of this article appears under 3.240 page 1 - March 1955)

1.60 BRUISED CONDITION OF THE AMERICAN PLAICE

Templeman, W. and Pitt, T. K.
Fisheries Research Board of Canada, Progress Reports of the Atlantic Coast Stations No. 59, 3-5 (August 1954)

(Abstract of this article appears under 2.15 page 5 - February 1956)

1.67 A BOLSTER FOR THE LOBSTER

Anonymous
Modern Refrigeration 58, 291 (August 1955)

(Abstract of this article appears under 2.43 page 9 - December 1955)

1.68 CHOLESTEROL METABOLISM IN THE MUSSEL MYTILUS EDULIS

Henschel, J. and Ranke, B.
Arch. Fischereiwiss., 6, 94-104 (1955) (Summary in English 103-104)
Food Science Abstracts 27, 625 (November 1955)

1.69 BIOCHEMICAL STUDIES ON OCTOPUS I. TRIMETHYLAMINE AND TRIMETHYLAMINE OXIDE CONTENT OF OCTOPUS

Asano, Motokazu and Sato, Haruo (Tohoku University, Sendai, Japan)
The Tohoku Journal of Agricultural Research V., 191-195 (December 1954)

(Abstract of this article appears under 8.8 page 17 - January 1956)

1.89 ABSORPTION OF SALT BY WHOLE CRAYFISH DURING COOKING

Anderson, K. W. (The Nicholas Institute, Sherbrooke, Vic., formerly of the Division of Food Preservation and Transport, C.S.I.R.O., Hobart, Tas.)
Food Preservation Quarterly 16, 14 (March 1956)

2.01 THE GROWTH OF BACTERIA ON HORSE MUSCLE, IN RELATION TO THE CHANGES AFTER DEATH LEADING TO RIGOR MORTIS

Ingram, M. and Ingram, G. C.
J. Sci. Food Agric., 6, 602-611 (1955)
Food Science Abstracts 28, 141 (April 1956)

Intrinsic clostridia in the muscles of whale carcasses have been observed to multiply rapidly after the muscles have passed into rigor mortis, but not appreciably before.

2.02 THE FIRST POST-MORTEM CHANGES IN THE MUSCULAR TISSUE OF FISH

Partmann, W.
Arch. Fischereiwiss., 5, 159-170 (1954) (In English)
Food Science Abstracts 27, 622 (November 1955)

2.111 EFFECT OF THE COLOR OF THE FIXED NET UPON THE DIFFERENCE BETWEEN THE MORNING AND EVENING CATCHES OF SEVERAL FISHES

Koizumi, Takashi
Bulletin of the Japanese Society of Scientific Fisheries 21, 1-5 (1955) (English abstract)

Skipjack, jack mackerel, etc., responded in the same manner to yellow and brown nets.

2.1120 A STUDY ON HOW FISH PASS THROUGH THE MESH OF VARIOUS SHORTENING NETS--II.

Kanda, Kenji
Bulletin of the Japanese Society of Scientific Fisheries 19, 643 (1953) (English summary, table, and figures)

The fish pass through the mesh of the net without touching the body.

2.1121 SKIFFS USED FOR SHRIMP FISHING IN INSIDE WATERS OF GULF OF MEXICO

Denham, S. C.
Commercial Fisheries Review 17, 39-41 (March 1955)

(Abstract of this article appears under 2.115 page 7 - September 1955)

2.1121 USING THE SWEDISH BOTTOM HERRING TRAWL

Anonymous
World Fishing 5, 32 (May 1956)

2.1125 (Cross Reference: 1.2)

MODEL EXPERIMENTS ON THE SARDINE PURSE SEINE OPERATING IN HYUGANADA. II.

Iitaka, Yunosuke
Bulletin of the Japanese Society on Scientific Fisheries 21, 6-11 (1955) (English abstract, tables, and figures)

A model purse seine was laid out in the standing water through a circular frame (figure 1), and the sinking appearance of its lead line was observed and photographed.

2.1125 (Cross Reference: 1.2)

THE EFFECT OF FISH FINDER IN SARDINE PURSE NET FISHERIES

Inoue, Makoto
Bulletin of the Japanese Scientific Fisheries 21, 12-14 (1955) (English abstract, tables, and figures)

The fishing power of sardine purse net fleets is raised several times by means of fish finders.

2.115 A STUDY ON THE WAVE-INDUCED ROLLING MOTION OF THE SHIP IN A SEAWAY (SEIKAN KORO)

Kawashima, Rihei
Bulletin of the Faculty of Fisheries, Hokkaido University 6, 216 (November 1955)

2.12 DIVER SEES PRAWN TRAWL IN ACTION

George, R. W. and Godfrey, K. C.
Fisheries Newsletter 14, 17 (July 1955)

(Abstract of this article appears under 2.1121 page 1 - January 1956)

2.12 EXPLORATORY AND EXPERIMENTAL FISHING

Holt, S. J. (Fisheries Division, FAO, Rome, Italy)
FAO Fisheries Bulletin IX., 1-22 (January-March 1956)

A review article with 38 references.

2.14 GEAR RESEARCH AND DEVELOPMENT. BEHAVIOR OF SHRIMP TRAWL VIEWED WITH UNDERWATER TELEVISION

Anonymous
Commercial Fisheries Review 17, 32 (July 1955)

(Abstract of this article appears under 2.1121 page 5 - February 1956)

2.14 USE OF INFRARED RADIATION IN THE STUDY OF FISH BEHAVIOR

Duncan, Rea E.
Special Scientific Report: Fisheries No. 170 (U. S. Department of the Interior, Fish and Wildlife Service, Washington, D. C.) (March 1956)

Infrared radiation can be used to observe the actions of fish in the dark. Experiments demonstrated that the behavior of fingerling silver salmon (O. kisutch) was not affected by infrared radiation. The infrared filters used did not pass wavelengths visible to an observer, and the actions of the fish were observed through an infrared viewer. The fish were not attracted or repelled by steady radiation, and they did not exhibit a fright reaction to flashing radiation. The orientation pattern in still or flowing water was not affected; there was no indication that the fish could perceive the wavelengths employed.

2.20 HOLDING LOBSTERS ALIVE

Anonymous
Trade News 8, 3-4 (August 1955)

(Abstract of this article appears under 1.87 page 1 - January 1956)

2.4 DETERMINATION OF COOK DRIP IN PACIFIC OCEAN PERCH (SEBASTODES ALUTUS) AND IN PACIFIC OYSTERS (OSTREA GIGAS) BY USE OF A NEW METHOD

Sumerwell, Wm. N.
Commercial Fisheries Review 17, 18-21 (March 1955)

(Abstract of this article appears under 3.249 page 17 - August 1955)

2.40 REFRIGERATION OF TUNA AND SARDINES BY SODIUM CHLORIDE BRINES

Farber, Lionel
Food Technology 9, 141-147 (March 1955)

(Abstract of this article appears under 2.15 page 19 - May 1955)

2.8 FISH--A NEGLECTED PROTEIN FOOD

Allen, Ida Bailey
Southern Fisherman 15, 22 (October 1955)

(Abstract of this article appears under 2.9 page 19 - March 1956)

3.235 TESTS PROVE IMPROVED FROZEN FOOD FLAVOR ACHIEVED WITH MSG LASTS FOR A YEAR

Kearns, M. Patricia; Fagerson, Irving S.; and Fellers, Carl R.
Quick Frozen Foods 17, 62, 63, 248 (June 1955)

(Abstract of this article appears under 3.230 page 11 - October 1955)

3.24 ANNUAL REPORT TO THE DANISH FISHING INDUSTRY

Anonymous
Arsberetning fra Fiskeriministeriets, Forsogslaboratorium for 1954, 32 pages (1955) (Copenhagen, Denmark)

(Abstract of this article appears under 2.15 page 5 - January 1956)

3.249 OXIDATIVE RANCIDITY IN FROZEN FISH

Tarr, H. L. A. (Pacific Fisheries Experimental Station, Vancouver, B. C.)
Chemistry in Canada 7, 39-41 (1955)
Chemical Abstracts 50, 3668 (March 1956)

3.4 IS SMOKED MEAT INJURIOUS TO HEALTH?

Keller, H. and Heidtmann, R. H.
Fleischwirtsch 7, 502-504 (1955) (Summary in English 503)
Food Science Abstracts 28, 14 (February 1956)

In feeding experiments with mice given strongly smoked meat as their sole source of food, no symptoms of ill-health were observed. It is therefore, concluded that meat processed by smoking is not harmful in the human diet.

3.4 FREEZE CURING OF BACON

Watts, Betty M. (The Florida State University, Tallahassee)
Food Technology 10, 101-103 (February 1956)

Dipping slices of raw pork into curing brines containing sodium chloride, sodium nitrite, sodium ascorbate, and liquid smoke and then freezing results in a excellent bacon-like product. The ascorbate and smoke prevents the development of rancidity.

4.00 ANIMAL FATS AND DISEASE

Shorland, F. B. (Fats Research Laboratory Department of Scientific and Industrial Research, Wellington, New Zealand)
Food Manufacture 31, 272-276 (July 1, 1956)

A review with 59 references.

4.11 LIVER OIL OF CENTROPHORUS GRANULOSUS I. ISOLATION OF SQUALENE FROM THE UNSAPONIFIABLE MATTER

Ayerbe, F. Ramos and Romero, M. A. Albi
Grasas y aceites (Seville, Spain) 6, 141-143 (1955)
Chemical Abstracts 50, 2192 (February 10, 1956)

4.11 METHODS OF ANALYZING SPERM-WHALE OIL AND ITS DERIVATIVES

Moldavskaya, A. S. and Dmitrieva, E. S.
Maslobino-Zhirovaya Prom. 21, 30-32 (1955)
Chemical Abstracts 50, 4531 (March 1956)

4.13 21ST ANNUAL REVIEW OF THE LITERATURE ON FATS, OILS AND DETERGENTS. I.

Piskur, M. M
Journal of the American Oil Chemists' Society 32, 255-271 (May 1955)

(Abstract of this article appears under 4.00 page 13 - February 1956)

4.13 THE COMPONENT FATTY ACIDS OF OPHIODON SP.

Kaneda, Takashi and Ishii, Seinosuke
Bulletin of the Japanese Society of Scientific Fisheries 19, 697 (1953) (English summary and tables)

4.14 STUDIES ON THE WHALE OIL. PROPERTIES OF OILS CONTAINED IN VARIOUS PARTS OF A WHALE BODY. PART 1 ON THE SEU-WHALE AND FIN WHALE. PART 2 ON THE SPERM WHALE. PART 3 ON THE FOETUS OF SPERM WHALE

Saiki, Masamichi and Mori, Takajiro
Bulletin of the Japanese Society of Scientific Fisheries 19, 611-621 (1953) (English abstract, figures, and tables)

LIST OF PUBLICATIONS REGULARLY ABSTRACTED

Analyst
Analytical Chemistry
Archives of Biochemistry and Biophysics
Biochemical Journal
Bulletin of the Faculty of Fisheries, Hokkaido University
Bulletin of the Japanese Society of Scientific Fisheries
California Fish and Game
Canadian Fisherman
Canadian Journal of Chemistry
Canadian Journal of Technology
Canner
Chemical Abstracts
Chemical and Engineering News
Chemical Engineering
Chemical Processing
Chemistry and Industry
Commercial Fisheries Review
Drug and Cosmetic Industry
FAO Fisheries Bulletin
Federation Proceedings
Feedstuffs
Fisheries Newsletter (Australia)
Fish. Res. Bd. Can., Prog. Repts. Atlantic Coast Stas.
Fish. Res. Bd. Can., Prog. Repts. Pacific Coast Stas.
Fishing Gazette
Flour and Feed
Food Engineering
Food Manufacture
Food Packer
Food Preservation Quarterly
Food Processing
Food Research
Food Science Abstracts
Food Technology
Frosted Food Field
Gourmet
Industrial and Engineering Chemistry
Industrial Refrigeration
Institutions
Journal of Agricultural and Food Chemistry
Journal of Applied Chemistry
Journal of Biological Chemistry
Journal of Nutrition
Journal of the American Chemical Society
Journal of the American Dietetic Association
Journal of the American Oil Chemists' Society
Journal of the Association of Official Agricultural Chemists
Journal of the Fisheries Research Board of Canada
Journal of the Science of Food and Agriculture
Maine Coast Fisherman
Meldinger Fra SSF (Herring Industry, Norway)
Modern Packaging
Modern Refrigeration
National Fisherman
National Provisioner
Nature
Nutrition Reviews
Pacific Fisherman
Pan American Fisherman
Poultry Science
Practical Home Economics
Progressive Fish-Culturist
Quick Frozen Foods
Refrigerating Engineering
Report of the Food Investigation Board (Great Britain)
Science
Southern Fisherman
Trade News (Fisheries Department, Canada)
Western Fisheries
World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above listed publications are included. Biological papers are generally omitted.

Editorial Clerk (Typist)--Gladys K. Chandler

4.29 CONFIGURATION OF 9,10-DIHYDROXYSTEARIC ACID

Gensler, W. J. and Schlein, H. N.
Journal of the American Chemical Society 78, 169-172 (January 5, 1956)

9,10-Dihydroxyoctadecanedioic acid, m.p. 121° to 122°C., is shown to be the racemic form by resolution with brucine. The half-ester of this acid is reduced with sodium and alcohol to 9,10,18-trihydroxystearic acid. This acid is tosylated, the 18-tosyloxy derivative is converted to the 18-iodo compound, and the iodo group is removed with zinc to give threo-9,10-dihydroxystearic acid, m.p. 94.5° to 95°C.

4.29 STUDIES ON THE CONJUGATED FATTY ACIDS PART I. THE CARR AND PRICE REACTION OF THE CONJUGATED FATTY ACIDS OBTAINED BY THE ALKALI-ISOMERIZATION OF HIGHLY UNSATURATED FATTY ACIDS

Tsuchiya, Yasuhiko and Kayama, Mitsu (Department of Fisheries, Faculty of Agriculture, Tohoku University, Sendai, Japan)
The Tohoku Journal of Agricultural Research 6, 133-146 (October 1955)

Substances which develop a violet color with the Carr and Price reagent after vigorous saponification of the fatty acids of cod liver oil in the Emmerie's experiment are the conjugated acids resulted from the alkali-isomerization.

4.5 REACTIONS OF FATTY MATERIALS WITH OXYGEN XVII. SOME OBSERVATIONS ON THE SECONDARY PRODUCTS OF AUTOXIDATION OF METHYL OLEATE

Coleman, Joseph E.; Knight, H. B.; and Swern, Daniel
Journal of the American Oil Chemists' Society 32, 135-137 (March 1955)

(Abstract of this article appears under 4.21 page 11 - October 1955)

4.62 STUDIES ON ENCEPHALOMALACIA IN THE CHICK. 2. THE PROTECTIVE ACTION OF DIPHENYL-P-PHENYLENEDIAMINE AGAINST ENCEPHALOMALACIA

Singsen, E. P.; Bunnel, R. H.; Matterson, L. D.; Kozeff, Anna; and Jungherr, E. L.
Poultry Science 34, 262-271 (March 1955)

(Abstract of this article appears under 5.7 page 13 - November 1955)

4.62 ANTIOXIDANTS PROVE EFFECTIVE IN DISEASE, SKIN STUDIES

Matterson, L. D.
Flour and Feed 56, 8-9 (July 1955)

(Abstract of this article appears under 5.7 page 19 - September 1955)

4.90 STUDIES ON THE NUTRITIVE VALUES OF LIPIDS IX. NUTRITIVE VALUE OF POLYMERIZED LIVER OIL OF DOG FISH

Kaneda, Takashi and Arai, Kimie
Bulletin of the Japanese Society of Scientific Fisheries 19, 700 (1953) (English summary and tables)

Polymerized liver oil and its deodorized product proved more nutritious to rats than unpolymerized liver oil or soybean oil.

5.6 RELATION BETWEEN VITAMIN D AND B_{12}

Frolich, Allan
Nature 174, 462-463 (September 4, 1954)

(Abstract of this article appears under 0.7 page 9 - December 1954)

5.7 STUDIES OF THE MECHANISM OF VITAMIN E ACTION. II. INHIBITION OF UNSATURATED FATTY ACID OXIDATION CATALYZED BY HERATIN COMPOUNDS

Tappel, A. L.
Archives of Biochemistry and Biophysics 50, 473-485 (June 1954)

(Abstract of this article appears under 4.21 page 1 - February 1955)

6.131 SIZE REDUCTION -- KEY TO PROCESS INNOVATION

Kovac, George M.
Food Engineering 26, 73-80 (December 1954)

(Abstract of this article appears under 0.12 page 13 - March 1955)

6.249 EFFECT OF TRACE MINERALS AND OTHER DIETARY INGREDIENTS UPON VITAMIN A STABILITY IN STORED POULTRY DIETS

Halvorson, A. W. and Hendrick, C. M.
Poultry Science 34, 355-360 (March 1955)

(Abstract of this article appears under 5.112 page 11 - November 1955)

6.54 STUDIES ON FISH MEAT JELLIES IV. ON RELATIONSHIP BETWEEN PHYSICO-CHEMICAL PROPERTIES OF PASTE AND OF STEAMED JELLY

Matsumoto, Juichiro J. and Arai, Tomiko
Bulletin of the Japanese Society of Scientific Fisheries 19, 781 (1953) (English summary and figures)

INDEX

Subject	Page No.	Card No.
Analysis, general		
Alkalinity of sea water	29	7.3
Analysis, inorganic		
Gas sampling device	15	7.47
Analysis, organic		
Identification of fish oils	11	4.11
Protein quality assay	17	7.51
Analysis for sperm-whale oil	25	4.11
Antioxidants		
Hematin catalyzed fat oxidation	13	4.62
Byproducts, miscellaneous		
Manufacture of fish silage	13	6.55
Fish meat jelly studies	27	6.54
Canned fish, processing		
Curd in canned salmon	5	2.15
Chemistry and biochemistry, miscellaneous		
Pyrimidine bases in herring roe	1	0.36
Composition, inorganic		
Phosphorus in skipjack tuna caeca	29	8.42
Composition, organic		
Studies on whale oil	25	4.14
Amino acids in crustaceans	29	8.51
Octopus pigments	29	8.59
Marine animal pigments	29	8.59
Composition, vitamins		
Vitamins in fresh tuna	19	8.6
Violaxanthin in trout eggs	29	8.6172
Exploratory fishing		
Tuna exploration	3	2.12
Exploratory fishing	23	2.12
Fish meal, nutritive value		
Cellulose digestion in rumen	15	6.19
Fish meal and oil, manufacture		
Liquid fish meal	13	6.15
Fishery biology and fish culture		
Salmon hatchery food	29	9.14
Fishery education		
International fisheries training	19	9.7
Fishing concerns and agencies		
South African fishery research	19	9.4
Fishing methods		
Effect of infrared light on fish	23	2.14
Freshness of fish		
Resazurin test for freshness	17	7.89
Freshness of fish by pH	29	7.84
Frozen fish, changes in during freezing and cold storage		
Changes in frozen plaice	9	3.249
Tissue autolysis during cold storage	9	3.249
Rancidity in frozen fish	25	3.249
Frozen fish, packaging		
Freezing in alginate	9	3.238
Packaging frozen poultry	9	3.238
Vapor permeability of films	11	3.238
Frozen fish, processing		
Progress in refrigeration	3	3.2
Handling fresh fish	7	2.19
Crystal formation in muscle	7	3.234
Gear, fishing		
Closing cod ends	5	2.1121
Netting color vs. catch	21	2.111
How fish pass through nets	21	2.1120
Swedish bottom herring trawl	21	2.1121
Purse seine laying experiments	23	2.1125
Fish finder aids seine catch	23	2.1125
Handling fresh fish		
Handling fish in chilled sea water	5	2.15
Handling fish on vessel	5	2.15
Salmon in sea water	7	2.15
Marine plant products		
Sources of agar in Ceylon	15	6.3
Nutritional value of fish and toxicity		
Canned mackerel spoilage	11	3.39
Nutritional value of fishery byproducts other than meal		
Salmon diet experiments	15	6.51
Oils, chemical and physical properties		
Fish oil research	11	4.20
Animal fats and disease	25	4.00
Isolation of squalene	25	4.11
Fatty acids from (Ophiodon sp.)	25	4.13
9,10-Dihydroxystearic acid	27	4.29
Conjugated fatty acid reactions	27	4.29
Oils, nutrition		
Nutritive value of liver oil	27	4.90
Oysters		
Freezing oysters	1	1.81
Preservatives and sanitation		
Sorbic acid food preservative	17	7.595
Sorbic acid as fungistat	17	7.595
Salmon		
Salt penetration in sea water	7	2.15
Shellfish and crustaceans, miscellaneous		
Cholesterol in mussels	21	1.88
Cooking whole crayfish	21	1.89
Smoked fish		
Curing bacon while frozen	25	3.4
Smoked meat vs. health	25	3.4
Spoilage		
Flora of fresh shark	1	0.5
Antibiotic for salmon	3	2.114
Bacterial growth on post-rigor muscle	21	2.01
Post-mortem fish muscle metabolism	21	2.02
Tuna		
1955 tuna pack	1	1.10
Vessels, fishing		
Sea-water tanks on J.R.D.	3	2.114
Ships rolling motion study	23	2.115

7.3 SOME NOTES ON THE METHOD OF ALKALINITY DETERMINATION

Matida, Yoshihiro
Bulletin of the Japanese Society of Scientific Fisheries 19, 703 (1953) (In English)

A mixed indicator composed of methyl orange and aniline blue was used for the determination of alkalinity in sea or inland water.

7.74 REPORT ON FISH AND OTHER MARINE PRODUCTS

Voth, Menno D.
Journal of the Association of Official Agricultural Chemists 38, 194-196 (May 1955)

(Abstract of this article appears under 7.7 page 15 - October 1955)

7.84 AN ASSAY METHOD FOR FRESHNESS OF FISHES BY THE ESTIMATION OF pH VALUE

Yamamoto, Makoto and Sonehara, Masanori
Bulletin of the Japanese Society of Scientific Fisheries 9, 761 (1953) (English summary, tables, and figures)

The pH value of fish meats at the early spoilage was 6.85 in the fishes of white meat and 6.27 in those of red meat.

8.42 BIOCHEMICAL STUDIES ON SKIPJACK (KATSUWONUS VAGANS) V. DISTRIBUTION OF PHOSPHOROUS IN PYLORIC CAECA

Horiguchi, Yoshishige and Kashiwada, Ken'ichi
Bulletin of the Japanese Society of Scientific Fisheries 19, 733 (1953) (English summary and tables)

8.43 DETERMINATION OF COOK DRIP IN PACIFIC OCEAN PERCH (SEBASTODES ALUTUS) AND IN PACIFIC OYSTERS (OSTREA GIGAS) BY USE OF A NEW METHOD

Sumerwell, William N.
Commercial Fisheries Review 17, 18-21 (March 1955)

(Abstract of this article appears under 3.249 page 17 - August 1955)

8.43 THE FAT AND WATER CONTENT OF HERRING

Brandes, C. H. (Institute of Marine Research, Bremerhaven, Germany)
Symposium on cured and frozen fish technology, Swedish Institute for Food Preservation Research, Goteborg, No. 100, Chapter 12,(November 1953)

(Abstract of this article appears under 8.53 page 17 - October 1955)

8.51 PAPER CHROMATOGRAPHIC STUDY OF THE CONTENT OF FREE AND PROTEIN-BOUND AMINO ACIDS IN CRUSTACEANS AND FISH

Ranke, B.
Arch. Fischereiwiss., 6, 109-113 (1955) (Summary in English 118)
Food Science Abstracts 27, 623 (November 1955)

8.59 STUDIES ON MARINE ANIMAL PIGMENTS II. ON THE PIGMENT-COMPONENTS FROM SKINS OF ASTEROIDEA

Nishibori, Kokichi
Bulletin of the Japanese Society of Scientific Fisheries 19, 648 (1953) (English table)

8.59 BIOCHEMICAL STUDIES ON THE OCTOPUS II. PIGMENTS OF THE INTEGUMENT AND INK SACK OF OCTOPUS

Asano, Motokazu and Ito, Masao (Department of Fisheries, Faculty of Agriculture, Tohoku University, Sendai, Japan)
The Tohoku Journal of Agricultural Research 6, 137 (October 1955)

The ink pigment in the ink sack of the octopus Octopus vulgaris belongs to the melanin group. In the integument of the octopus, violet black, red brown (orange) and yellow chromatophores are found. Red pigment from the violet black chromatophores belongs to the "ommochrome" group.

8.6172 (Cross Reference: 1.37)

VIOLAXANTHIN IN RAINBOW TROUT EGG

Hirao, Shuichi; Yamada, Juami; and Kikuchi, Ryo
Bulletin of the Japanese Society of Scientific Fisheries 20, 431 (1954) (English summary and tables)

A kind of carotenoid was obtained from the egg. From its absorption maxima and chromatographic behavior this carotenoid can be identified with violaxanthin.

9.14 TESTS OF HATCHERY FOODS FOR SALMON, 1953 AND 1954

Combs, Bobby D.; Palmer, David D.; Finucane, John H.; and Burrows, Roger E. (U. S. Salmon Cultural Laboratory, Entiat, Washington)
Special Scientific Report: Fisheries No. 160 (August 1955)

Chinook and blueback salmon were used in feeding trials during 1953 and 1954. One excellent diet which was developed in 1953 for chinook salmon fingerlings utilized arrow-toothed halibut (Atheresthes stomias) as a substitute for a portion of the more expensive meat components. The 1954 blueback salmon feeding trials were designed to develop virus-free rations. Several diets devoid of salmon viscera, the suspect carrier, were tested and found satisfactory. The 1954 chinook experiments were designed to study diets containing 50 percent of dry meals. No satisfactory high-meal diet was produced from these trials.

INT.-DUP. SEC., WASH., D.C.3734

ed States
t of the Interior
Wildlife Service
gton 25, D. C.

---

ial Business